A Dissertation On

"EFFECT OF SCALP ACUPUNCTURE ON UPPER EXTREMITY FUNCTIONAL RECOVERY IN CHRONIC HEMEPLEGIA." A RANDOMISED CONTROL STUDY

Submitted By

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ENDORSEMENT BY THE PRINCIPAL

I certify that the dissertation entitled **"EFFECT OF SCALP ACUPUNCTURE ON UPPER EXTREMITY FUNCTIONAL RECOVERY IN CHRONIC HEMIPLEGIA**."**"** is the record of original research work carried out by **Dr. K.VENKATESAN,** in the Department of Acupuncture & Energy Medicine, Government Yoga & Naturopathy Medical College & Hospital, Chennai – 600 106 submitted for the degree of **DOCTOR OF MEDICINE (M.D) in Yoga and Naturopathy** under my guidance and supervision, and that this work has not formed the basis for the award of any degree, associateship, fellowship or other titles in this University or any other University or Institution of higher learning.

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The Institution Ethical Committee of Government Yoga & Naturopathy Medical College Hospital, Chennai reviewed and discussed the application for approval of **"EFFECT OF SCALP ACUPUNCTURE ON UPPER EXTREMITY FUNCTIONAL RECOVERY IN CHRONIC HEMIPLEGIA."** for project work submitted by Dr. K.VENKATESAN, 2nd Year M.D. Acupuncture & Energy Medicine, Post Graduate, Government Yoga & Naturopathy Medical College & Hospital, Chennai – 600 106.

The proposal is APPROVED.

The Institutional Ethical Committee expects to be informed about the progress of the study and adverse drug reaction during the course of the study and any change in the protocol and patient information / informed consent and asks to be provided a copy of the final report.

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Date

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LIST OF ABBREVATIONS

scalp acupuncture	SA
fugyl meyer assesment	FMA
world health organization	WHO
complementary and alternative medicine	CAM
national institutes of health	NIH
western medical acupuncture	WMA
action research arm test	ARAT
stroke specific quality of life	SSQOL
Cerebro vascular accident	CVA
hyper tension	HTN
Diabetes mellitus	DM
Middle cerebral artery	MCA
Transient ischemic attack	TIA
posterior inferior cerebellar artery	PICA
anterior inferior cerebellar artery	AICA
Upper extremity	UE
Lower extremity	LE

CONTENTS

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ABSTRACT

OBJECTIVE: To evaluate the effect of scalp acupuncture in upper extremity functional recovery in chronic hemiplegia.

BACKGROUND: Hemiplegia, or paralysis of one side of the body, is caused by injury or illness, and leads to disabilities of limbs. People with hemiplegia are limited upper limb movement in their daily activities. This study was planned to evaluate the effect of scalp acupuncture in upper extremity functional recovery in upper extremity in chronic hemiplegia

DESIGN AND METHOD: a randomized trail performed among **60** patients with hemiplegia age group of 30 to 60. The subjects will be recruited from the Out-patient, in patient department of Government Yoga Medical College Hospital, Chennai.After obtaining informed consent, Participants (n = 60) who fit the inclusion and exclusion criteria Will be randomly allocated into a scalp acupuncture group (n = 30), control group (n = 30). The Scalp acupuncture group received (scalp acupuncture drawing method) scalp acupuncture therapy, 20 minutes per day. 5 sittings per week. And control group continue the hemiplegic conventional therapy. Outcome measures FMA, ARAT, SSQOL will be determined at baseline (before intervention), 6th week end of the intervention ,

RESULTS: Primary outcome: upper extremity functional recovery showed statistically significant improvement in both Groups ($P<0.001$). However on observing variance value Group A showed better improvement than Group B($P<0.05$).

INTRODUCTION

1. INTRODUCTION

Hemiplegia is the common symptom of stroke, which leads in diverse sensory, motor, perception, language, and recognition issues[1]. Hemiplegic patients are commonly accompanied with a decline in trunk adjustment ability. In specific, it causes a decrease in the activities of the lateral trunk muscles, and an increase in the irregularity between the right and left the side, as well as paralysis of the upper and lower limbs. Additional complications are a decrease in the synchronized contraction of the trunk muscles and a tendency to fall towards the affected, triggering problems, such as qualitative degradation of gait[2]

Hemiplegia, a paralysis of one side of the body is the typical sign of neuro-vascular diseases of the brain. It occurs with strokes involving the cerebral hemisphere or brainstem.[3] cerebrovascular accident (CVA) is an acute onset of neurological deficit due to an deformity in cerebral circulation with consequential signs and symptoms that corresponding to the impact of focal areas of brain.

Hemiplegia may be the most obvious sign of CVA and a major concern for therapists. The three most commonly recognized risk factors for CVA include hypertension (HTN), diabetes mellitus (DM) and heart disease.[4]

Cerebro vascular accident (CVA) can be classified according to pathological type- thrombosis, embolus, or hemorrhage. Two main mechanisms results in stroke. Strokes can be ischemic,

Because of the thrombus, embolism or conditions that create low systemic perfusion pressure. The resulting lack of cerebral blood flow deprives the brain of needed oxygen and glucose disrupts metabolism and leads to injury and death of brain tissues.[5] In case of hemorrhagic stroke

there is bleeding in to the extra vascular compartment of brain secondary to trauma or aneurysm. Hemorrhage results, in abnormally increased intracranial pressure with damage to the brain tissue and restriction of distal blood circulation

.

Following the onset of stroke or cerebrovascular accident with hemiplegia, a low tone of flaccidity occurs in extremities. The period of this state of flaccidity varies from a short time to weeks or months. The state is followed by the development of pattern of returning muscle function and pattern of increased tone. The rate at which these patterns of muscle function return is indicted by the site and severity of the lesion and by the focus of rehabilitation.[6]

Middle cerebral artery (MCA) strokes frequently affected the upper extremity than the lower extremity. The middle cerebral artery has higher incidence rate of stroke [7]. Voluntary movement control is habitually impaired after stroke.

Movement control of the body on the opposite side of brain lesion, proceeds through stages of regaining in which the motor and sensory functions are often reestablished abnormally. In the upper extremity after a period of flaccidity a Common of recovery includes the development of an uncontrolled flexion synergy.

This pathological synergy is found in the hemiplegic limb during efforts to use the arm for activities for daily living. These disabilities lead to development of compensatory strategies for accomplishing daily needs and frequently minimize the use of the affected arm and hand.

Paresis or weakness found in 80 to 90% of all patients after hemiplegia followed by stroke. During the period of paresis specific changes occur in both the motor unit and muscle. The number of functioning agonist motor unit is decreased by as much as 50 percent at 6 months. In case of stroke patients there is abnormal recruitment of motor units with altered order and impaired firing rates reported.[8]This leads to inefficient muscle activation, difficulties trying to maintain a constant level of force production and increased effort while complaining of feeling of weakness. Movement times are prolonged, a timing abnormality that contributes to impairment of coordinated motor sequences[9]. Changes in muscle composition include atrophy of muscle fibers with a greater loss of type –II fast twitch fibers. The selective loss of type II fibers results in difficulty with initiation and production of rapid high force movement.[10]

Recovery from stroke is generally fastest in the first weeks after onset; with measurable neurological and functional recovery occurring in the first 1 to 3 months after stroke. During this period the stimulation from active rehabilitation is necessary. The basis of facilitation and re-education treatment programs in neurologically involved patients is the bombardment of CNS with sensory Information [11.]

Savinelli, R. et.al., (1978) reported that Hemiplegia is caused by injury to the brain or due to some disease which leads to difficulties in locomotor functioning, cardiopulmonary function, and sensory functioning. [12]

From a TCM theory aspects, stroke is related to the Liver, kidney and spleen systems. The predisposing factors for stroke may take years to develop and are often the result of emotional and physical strain, poor diet, overwork, and lack of relaxation. These lifestyle habits deplete the body of vitality which often leads to an accumulation of Phlegm and or Wind. Over time these internal factors of phlegm and wind build to varying degrees and may culminate in a stroke.

In the case of wind stroke, Chinese medicine plays both a preventative and a rehabilitative role. In its prevention role, Chinese medicine is used to treat many of the common risk factors for stroke, such as hypertension and diabetes. In its rehabilitative role, Chinese medicine is used to treat the effects of stroke. Accordingly, Chinese medicine is useful for side effects such as paralysis, speech issues, muscle weakness and flaccidity.

Phlegm is the result of the Spleen being weakened by a poor diet and or physical-mental strain. An accumulation of Phlegm disrupts the smooth flow of Qi within the body and may result in symptoms such as poor concentration-muddled thinking, and or numbness of the limbs. Over time this Phlegm will stagnate and transform into Phlegm-heat which may rise to the head and ultimately cause a stroke.

Wind is often the result of emotional and mental strain coupled with a lack of relaxation and poor dietary habits. Too much stress in life can deplete the Yin of both the Kidneys and the Liver which can lead to Wind rising up and causing a stroke or symptoms such as high blood pressure, headaches, emotional issues, etc.

The treatment theories for stroke are divided into two main categories - those that effect the muscles and or channels and those that affect the internal organs (more serious). The internal channel differentiations are further subdivided into a general deficiency pattern or an excess one. In clinical practice, patients will often have a mix of deficiency and excess symptoms. Additionally, as patients with more severe strokes move into the rehabilitation stage they will be treated according to the muscle and or channels differentiations which deal with the side effects of a stroke. This research will identify provide references for upper extremity functional recovery in chronic hemiplegia using scalp acupuncture.

AIM & OBJECTIVES

2.AIMS AND OBJECTIVES

2.1Aim

Aim: To evaluate the effect of scalp acupuncture in upper extremity functional recovery in chronic hemiplegia.

2.2Objectives of the study

The objectives of the present study is

1. To assess the functional recovery in upper extremity in chronic hemiplegia
2. To quality of life in hemiplegia

Above said parameters are measured before intervention (baseline) and after (Intervention end of 6^{th} week).

REVIEW OF LITERATURE

3.REVIEW OF LITERATURE

3.1INTRODUCTION:

Stroke is the rapid development of a focal neurologic deficit caused by a disruption of blood supply to the corresponding area of brain. The brain, in contrast with other organs, localizes specific functions to particular regions. Hence occlusion of an artery supplying a small area of brain has a profound and specific effect.

Paralysis may affect any one part (e.g. the arm, the leg) or the entire side of the body. Severe or complete loss of muscular functions on one side of the body will be present in this condition. When the right side of the brain is affected, the left side of the body is paralyzed (and vice versa). Hemiplegia may be both congenital (since birth) or acquired (from other illnesses such as a Stroke). The two main causes of stroke are: ischaemia, or the lack of blood supply to the brain; and hemorrhagic, which results from a fissure in an intracranial artery [13]

Langhorne, P. et.al., (2009) found that stroke resulted in the difficulty of motor activities and which results in the limitation of their movements. In addition, non-cognitive neuropsychiatric symptoms may occur after stroke, such as depression, anxiety, emotional lability, apathy and post-stroke fatigue [14]

Stroke is defined by the World Health Organization (WHO) as the "rapidly developing clinical signs of focal (at times global) disturbance of cerebral function, lasting more than 24h or leading to death with no apparent cause other than that of vascular origin" (Hatano, S, 1976)[15]

3.2EPIDEMIOLOGY*:*

A study conducted on the Incidence estimate and guideline-oriented treatment for poststroke spasticity based on German statutory health insurance in 2009, revealed that 3.7 per 1000 persons had stroke. There were about 242090 insurants out of which 1263 of the (sample population) were admitted to a hospital for acute stroke in the year of 2009.[16]

The World Health Organization (WHO) estimates that a stroke occurs every 5 seconds[17]. In 2005, it accounted for approximately 10% of all deaths worldwide. Globally, stroke is the second leading cause of death [18]. More than 80% of strokes occur in the developing countries.

3.3Risk factors for ischemic stroke:

A study conducted on the Incidence estimate and guideline-oriented treatment for post- stroke spasticity based on German statutory health insurance in 2009, revealed that 3.7 per 1000 persons had stroke. There were about 242090 insurant out of which 1263 of the (sample population) were admitted to a hospital for acute stroke in the year of 2009 (Veronika Egen-Lappe, et.al., 2013) [19]

Generally, risk factors for stroke can be classified as modifiable and non modifiable (Sacco et al., 1977) [20] . Non modifiable risk factors for stroke are important to detect, even if no measure can be taken to eliminate them, because their presence helps to identify individuals at higher risk and thus justifies the implementation of vigorous treatments to reduce the modifiable risk factors.

3.3.1Non- modifiable risk factors*:*

a) Genetics

b) Family history

c) Age

d) Gender

e) Family history

f) Race/Ethnicity

g) Genetics

3.3.2Modifiable risk factors:

a) Hypertension,

b) Cigarette smoking

c) TIA and Prior stroke

d) Cardiac disease

e) Diabetes Mellitus

f) Cigarette smoking

g) Dyslipidemia

h) Obesity

i) Alcohol consumption

j) Asymptomatic carotid artery disease

k) Aortic arch atheromatous

l) Oral contraceptives use

3.3.3Non- modifiable risk Factors:

3.3.3.1AGE:

Increasing age is the most powerful and important risk factor for stroke. The incidence of stroke doubles each decade past 55 years of age for both men and women (Brown et al., 1966: Wolf et al., 1992) [21,22]. Half of all strokes occur in people older than 70 to 75 years in the western world.

3.3.3.1.SEX:

The incidence of ischemic strokes is more common in males in all age groups, whereas ischemic infarcts are more common in females beyond 60 years of age. It is probably due to protective benefits of reproductive age group and increased prevalence of vascular risk factors in males (Bogousslavsky et al 1988)[23], (Brown et al) [24].

3.3.3.2FAMILY HISTORY:

In Framingham study, parental history of stroke or coronary artery disease is a risk factor for stroke [Kiely et al., 1993][25].

It plays a minimal role in the pathogenesis of cerebral infarct. However, increased risk is seen with a family history of stroke among first degree relatives.

3.3.4Modifiable risk Factors:

3.3.4.1HYPERTENSION:

In late adult life, HTN is certainly the strongest modifiable risk factor for ischemic stroke. HTN is present in approximately 60 - 70% of ischemic stroke cases. The risk of stroke rises symmetrically to blood pressure, for females as well as for males, and almost doubles for every 7.5 mm Hg increment in diastolic blood pressure (DBP) (Collins and McMahon, 1994) [26].

In a meta-analysis (Prospective Studies Collaboration, 1995) [27], the relative risk for increasing stroke between the highest and the lowest quintiles in diastolic blood pressure was tenfold, fivefold and twofold for individuals aged at the time of screening <45, 45-64 and > 65 years, respectively. The connection between systolic blood pressure, including ‘isolated systolic hypertension , may be even greater than for DBP (Shaper et al., 1991; Keli et al., 1992) [28].

3.3.4.2DIABETES MELLITUS:

Diabetes mellites is associated with hemeplegia, independently of the various cardiovascular risk factors which usually accompany this disease (hypertension, dyslipidemia and obesity). It increases the risk of ischemic cerebrovascular disease two to four fold (Weinberger et al and). Stroke is due to atherosclerosis, embolism and neurological abnormalities.

3.3.4.3SMOKING :

smoking is an independent risk factor for hemiplegia in men and women of all ages. In their meta-analysis, Shinton and Beevers (1989) [29] . the relative risk of stroke for smokers and former smokers, as comparing with non smokers, was 1.5 and 1.17, respectively. The risk for stroke is 2 to 3 times greater than in non-smokers.

The threat of stroke was increased proportionally to the number of cigarettes smoking per day, and is higher in men compared to women. It is due to enhanced atherogenesis, decreased capacity of the blood to deliver oxygen, cardiac arrhythmias, and arterial spasm. Homer and In gall have documented the importance of long duration cigarette smoking in the development of carotid atherosclerosis.

3.3.4.4ALCOHOLISM*:*

There is J shaped association between liquor consumption and stroke. using one or two drinks per day evenly distributed throughout the week offers a reduced risk, whereas moderate to heavy drinking is associated with an increased risk for ischemic stroke.

3.3.4.5. DYSLIPIDEMIA:

High total cholesterol and high levels of low density lipid LDL lead to atherosclerosis. But association of total cholesterol levels with cerebrovascular disease is less clear. In large meta-analysis study 45 prospective cohorts including 13,000 ischemic strokes (Prospective Studies Collaboration. 1995) [30], plasma total cholesterol levels were highly significantly associated with the risk of increasing the chance of stroke, but only in the

subset of individuals aged <45 at the time of screening. In contrast, no association was observed for older groups.

Recent Meta analyses however have indicate that ischemic stroke risk increases with increasing serum cholesterol and the decrease in stroke risk is associated with statin therapy. (Amarenco et al 2004, Tirschwell et all 2004)[31]. Prospective studies and interventional studies (Crouse et al., 1997)[32]using highly effective lipid-lowering agents show that decreasing cholesterol levels in plasma significantly reduses the risk of stroke.

3.3.4.6ATRIAL FIBRILLATION:

Chronic non-valvular atrial fibrillation is related with an overall risk for stroke of around five to six fold and above 18 fold if there is related with rheumatic heart disease. The prevalence of atrial fibrillation increases with advancing age and is 0.5% for patients aged 50 -59 years

and 8.8% for those aged 80 – 89 years. 70% of individual with atrial fibrillation are among 65 and 85 years of age. It accounts for two thirds of cardiac embolism.

3.4.Blood supply of the brain:

Brain is supplied by two large arteries i.e.

1.internal carotid artery and

2.Vertebrobasilar artery.

3.4.1MIDDLE CEREBRAL ARTERY:

It arises from internal carotid artery. It has superficial and deep hemispherical divisions.

The superficial cortical branches supply lateral surface of cerebral hemisphere (Frontal, Parietal and temporal lobes). Deep hemispherical branches are of two types,

(a) deep penetrating vessels from the cortical arteries,

(b) Lenticulo striate branches from MCA stem.

Deep penetrating arteries supply fronto parieto temporal sub cortical white matter. Lenticulo striate branches supply the putamen, head & body of caudate nucleus, globus pallidus, posterior limb of internal capsule and corona radiata.

3.4.2ANTERIOR CEREBRAL ARTERY:

It also originates from internal carotid artery & supplies the anterior three quarters of the medial surface of cerebral hemisphere, orbito frontal cortex, a strip of the lateral surface of the cerebral hemisphere along the superior border. Deep branches supply anterior limb of internal capsule and head of caudate.

3.4.5.POSTERIOR CEREBRAL ARTERY:

It originates from the rostral end of the basilar artery. P1 segments gives rise to thalamo perforating artery to midbrain and thalamus. P2 segment gives rise to thalamo geniculate artery supply to ventro postero medial and lateral nucleus of thalamus, pial branches to medial temporal cortex and calcarine artery to medial occipital cortex.

3.4.6.VERTEBRAL ARTERY:

They supply the lower ¾ th of the pyramid, the medical lemniscus in medulla, restiform body & postero inferior part of cerebellar hemisphere.

3.4.7BASILAR ARTERY:

It arises from paramedian perforators, long and short circumferential arteries. They

nourishes pons and mid brain either directly or indirectly through AICA & SCA, which also originate from basilar artery.

3.4.8.POSTERIOR INFERIOR CEREBELLAR ARTERY:

Posterior inferior cerebellar artery usually arises from vertebral arteries and supplies the inferior cerebellar peduncle, dorsolateral tegmentum of medulla, inferior surface of vermis and adjacent cerebellar hemispheres.

3.4.9.ANTERIOR INFERIOR CEREBELLAR ARTERY:

It (AICA) originates from basilar artery and supplies the flocculus, inferior surface of cerebellar hemispheres, middle cerebellar peduncle and lateral pontine tegmentum.

3.4.10. SUPERIOR CEREBELLAR ARTERY:

It (SCA)starts from basilar artery and supplies lateral tegmentum of midbrain, superior cerebellar peduncle, superior surface of cerebellum and cerebellar nuclei.

3.5Clinical features of ischemic stroke:

3.5.1CAROTID TERRITORY INFARCTS:

They comprise of MCA and ACA syndrome. In addition amaurosis fugax is the sole feature that differentiates the carotid artery syndrome from MCA syndrome.

3.5.2MIDDLE CEREBRAL ARETRY SYNDROME:

middle cerebral artery syndrome is one of the usual manifestations of cerebrovascular disease. MCA territory was involved in more than two-thirds of all infarcts (Lausanne

stroke registry, 1988) . [33]The clinical features are varied and depend on whether the site of occlusion is in the stem, superior division, inferior division or lenticulo striate branches and whether there is good collateral flow.

3.5.3Stem occlusion of MCA:

There is a large hemispheric infarction with contra lateral hemiplegia, conjugate eye deviation towards the side of the infarct, hemianesthesia and homonymous hemianopia. Related with global aphasia happens if dominant hemisphere is involved and hemi neglect with non-dominant hemispheric lesions

3.6.Diagnostic methods

Neuro imaging

3.6.1.CT BRAIN:

Non enhanced cranial computerized tomography scan is done in all patients, it may detect hemorrhage or mass lesions that can be exist as ischemic stroke. Early CT signs of ischemic stroke in the middle cerebral artery territory, such as loss of grey - white matter differentiation, insular ribbon sign, sulcal effacement, effacement of the sylvian fissure and obscuration of lentiform nucleus are very important. Dense MCA sign (Hyper density in the horizontal part of the MCA in NECT) can be seen in few subjects before the infarction turn out to be visible. It denotes thrombotic or embolic occlusion of MCA stem predicting a large cortical infarction.

On admission, CT brain is negative in approximately 1/3 of patients in whom ischemic stroke has been diagnosed clinically. This could be because of taking CT scan early before obvious tissue damage and variations in density of lesion occurs.

Computerized tomography of Brain may not identify relatively small infarcts in Vertebrobasilar system, infarcts near base, infarct <5mm in diameter and infarcts with mild oedema.

3.6.2.MRI Brain*:*

It produces images that are more detailed and clear than those of CT brain and it provides more information about tissue characteristics. It can detect infarct in early stages, especially with DWI imaging, infarcts in posterior fossa structures and small infarcts.

3.6.3Blood glucose:

Fasting blood glucose, glycosylated haemoglobin, are good indicators of diabetes mellitus control.

Lipid profile:

Since LDL-cholesterol levels <100 mg/dl throughout life are associated with a very low risk or coronary heart disease in peoples, they can be called optimal.

Even when LDL-cholesterol concentrations are near optimal (100–129 mg/dl), atherogenesis occurs; hence, such levels must also be called above optimal. At levels that are borderline high (130–159 mg/dl), atherogenesis continues at a significant rate, whereas at levels that are high (160–189 mg/dl) and very high (190 mg/dl) it is evidently accelerated. Similarly, triglycerides (TG)are classified in to three categories.

Normal: < 150 mg/dl, Borderline high: 150 – 199 mg/dl, High: 200 - 399 mg/dl. HDL cholesterol values are classified in to two categories, Low < 40 mg/dl and Normal > 40 mg/dl. (National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults - Adult Treatment Panel III, 2002) [34].

*3.6.4*ELECTROCARDIOGRAM

The heart should be assessed in all patients with stroke. ECG may reveal evidence of myocardial ischemia or infarction, arrhythmias especially atrial fibrillation, Left Ventricular Hypertrophy.

3.6.5.Echocardiogram:

Echo cardiogram are safe methods of evaluating structural problems and cardiac anatomy . It allows the discover the potential cardiogenic sources of cerebral emboli such as left atrial thrombus, atrial septal aneurysm, patent foramen ovale with right to left shunt, valvular heart disease, cardiac failure and cardiomyopathy.

It can also detect mitral valve prolapse, hypokinetic left ventricular segment and left ventricular dysfunction and hypertrophy.

Individuals with mitral annular calcifications have two-fold risk for ischemic stroke compared to those without. MVP stroke risk is more among men older than 50 years with thick mitral leaflet on echocardiography and with mitral regurgitation.

Trans esophageal Echocardiography is more accurate and detects structural problems better compared to Trans thoracic Echocardiography

CLINICAL FEAUTURES

Hemiplegia sign

hemiplegia caused by a lesion of the pyramidal tract. This is the main neural pathway that carries the motor orders. It is therefore a set of neurons involved in voluntary movement .

The pyramidal pathway starts in the brain at an area of nerve cells of pyramidal shape and connected with other nerve cells of the spinal cord. Pyramidal tract neurons then transmit their orders to lower motor neuron which carry them to the muscles .before reaching the spinal cord,

Brain stem, the pyramidal tract changes sides. This explains that the lesion is localized on the side opposite the affected limb: left brain injury causes a right hemiplegia and vice versa

Observed with different depending on the location of the injury.

When the lesion in the brain cortex, this causes a disproportionate hemiplegia: the face and upper extremities are predominantly affected.

When the lesion is located in the white matter of the brain, this causes a proportional hemiplegia: arm and leg are affected similarly deficient.

A brainstem lesion, it causes a paralysis of one side of the body and involvement of the face on the other side

Hemiplegia Symptoms

In some cases the lesions, arm and leg are affected, in others only the arm or only the face. When hemiplegia is partial and that movements are still possible, there is a decrease in muscle strength and mobility impaired, as manifested by clumsiness, trouble walking accompanied by a great tiredness and falls of one side.

When hemiplegia is total, even the reflexes are abolished. However, the Babinski sign is present: when you touch the outside of the foot, it causes an extension of the big toe. In a healthy person, this stimulation leads to a bending of the big toe.

Hemiplegia is accompanied by changes in muscle tone: the muscles are stiff and overly contracted any (spastic hemiplegia) or conversely soft and flabby (flaccid hemiplegia). On the face, the damage to the muscles can result in a drooping eyelid or an asymmetric smile.

Hemiplegia Other Symptoms

In addition to motor disturbances, hemiplegia is characterized by the appearance of other symptoms.

- Pain- There is pain associated with brain injury and localized pain in the affected limbs
- Aphasia- People who suffer from hemiplegia, even though the process of thinking

and developing ideas is held, are struggling to find words and articulate. In addition, they may have difficulty understanding the meaning of words they hear or read them.

- Disorders of the sphincters- A quarter of people with hemiplegia have sphincter disturbances resulting in either urinary incontinence or urinary retention, fecal incontinence is still.
- Sexual dysfunction- erection, ejaculation is compromised in many men with hemiplegia. Moreover, a decreased libido, especially at the beginning of the disability, is often found.

Hemiplegia Complication

The immobility of paralysis arising Member is responsible for complications that specialists in physical medicine and rehabilitation at trying to prevent the initial management. The main complication remains on the loss of autonomy: everything must be done to try to recover mobility as complete as possible. Among the complications that can occur after hemiplegia Pain in joints of immobilized different: the shoulder is often affected with a stiffening of the muscles

(spasticity) and local inflammation Moreover, the bones of people with hemiplegia are weakened and lose bone density (osteopenia) as the brain give rise to abnormal vascularization of bone. Finally, sitting in a wheelchair or bedridden status may promote pressure sores (skin necrosis at the points of support) and problems such as venous disorders of venous circulation, the risk of phlebitis and oedema. The sphincter disturbances can cause infectious complications

Conventional Management

Pharmacotherapy

A study conducted by Feeney, D M. et.al., (1993) on Nor-adrenergic pharmacotherapy, intra cerebral infusion and adrenal transplantation showed improvement in the functional recovery after cortical damage which revealed that the widespread reduction of glycolytic and oxidative metabolism, produced by focal cortical injury, is normalized by the same treatment which alleviates symptoms and is worsened by drugs which exacerbate deficits. The data support the hypothesis that providing SRE (symptom relevant experience) during a period of enhanced NA (noradrenergic) synaptic activity produces an enduring functional recovery after cortical injury by attenuating remote functional depression[35]

Pharmacotherapy administered to enhance the Cognitive and Motor Recovery following Stroke were especially the antidepressants, acetyl-cholinesterase inhibitors and memantine for aphasia. But, clinical trials are needed to address the shortcomings of stroke management. (Xabier Beristain, 2015)[36]

Surgical Approach

Surgical approaches in case of Hemiplegia include tendon transfer, muscle lengthening, and arthrodesis. These procedures are considered to be permanent to fix the solutions: in case of arthrodesis, where the overall range of movement is reduced. Achieving a more functional hand position and improving the appearance or hygiene of the arm and hand are the goals of the treatment. Robust studies of long-term outcome are only few that are available, but there is evidence of benefit (Smitherman, J A. et.al., 2011), (Eliasson, A C. et.al., 1998), (Skold, A. et.al., 1999) [37,38,39]

The long-term benefit in terms of function and cosmesis from the patients aspect were perceived by many Research scholars. (Skold, A. et.al., 2007), (Johnstone, B R. et.al.,2003)[39]

3.6.**ACUPUNCTUE AND HEMIPLEGIA**

Traditional Chinese Medicine theory perspective, hemiplegia is related to the kidney ,liver and spleen systems. The causative factors for stroke may take more years to develop and are often the result of emotional and, overwork, physical strain ,poor diet and lack of rest . These lifestyle disorders deplete the body's vital energy which often leads to an accumulation of Phlegm and or Wind. Over time these internal factors of phlegm and wind build to varying degrees and may culminate in a stroke.

In the case of wind stroke, TCM plays both a rehabilitative and preventative role. In its prevention role, TCM is used to treat many of the common causative factors for stroke, such as HTN and diabetes. In its rehabilitative role, Chinese medicine is used to treat the effects of stroke. Accordingly, TCM is useful for side effects such as numbness, dysarthria , muscle weakness and flaccidity.

Phlegm is the result of the weakness of Spleen by a poor diet and or mental and physical strain. An accumulation of Phlegm disrupts the normal flow of Qi within the body and may ends in symptoms such as muddled thinking,-poor concentration and or numbness of the limbs. Over time this Phlegm will stagnate and transform into Phlegm-heat which may rise to the head and ultimately cause a stroke and leads to hemiplegia .

Wind is the predominant pathologic factor often result in emotional and mental strain coupled with a lack of relaxation and poor dietary habits. Excessive stress in life can

consume the Yin of both the liver and the kidney which can lead to Wind moving up and causing a stroke or symptoms such as HTN , headaches, emotional issues, etc.

The treatment strategy for stroke are divided into two main categories - those that effect the muscles and or channels (generally mild) and those that affect the internal organs (more serious). The internal channel differentiations are further subdivided into a general deficiency pattern or an excess one. clinically, patients will often have a mix of deficiency and excess symptoms. Additionally, as patients with more severe strokes move into the rehabilitation stage they will be treated according to the muscle and or channels differentiations which deal with the side effects of a stroke. This research will identify and provide references for post stroke treatments using scalp acupuncture.

Theory of TCM for Wind Stroke

Wind stroke refers to a disorder manifested by sudden loss of consciousness with paralysis and dysphasia, numbness,unilateral weakness, or to a disorder manifested by sudden onset of facial paralysis and unilateral paralysis without experiencing unconsciousness. Because of its sudden and acute onset, rapid alterations and multiple symptoms in manifestations, and the onset of sudden fall and contractions are similar to the natural characteristics of wind, which is migrating ,moving, and changing rapidly. Stroke, with the above said characteristics, is therefore given the name wind-stroke in(TCM)Chinese medicine.

3.6.1. Wind Stroke

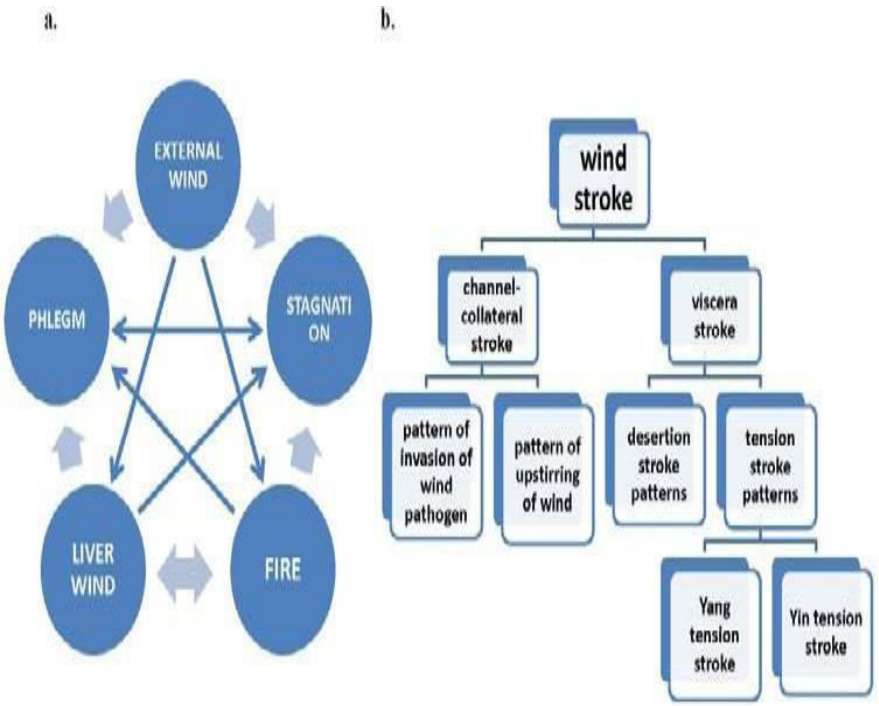


Fig 3.1. schematic diagram for wind stoke

THE ETIOLOGY AND PATHOGENESIS OF HEMIPLEGIA

1) Improper Diet:

Spleen's ability could impair to transform and transport(TT); such impairment causes generation of phlegm, which can cover the Heart orifice or obstruct the flow of the channels. Corresponding manifestations include hemiplegia and aphasia or loss of consciousness .

2)The Emotional Stress:

Excessive emotional stimuli affect both the Heart meridian and the Liver meridian. When disturbed by intense emotional stresses, Heart fire extremely flares upward while hyperactive Liver Yang would create Liver wind. Mutually aggravating each other, Heart fire and Liver wind will further cause Qi and Blood to ascend upward direction to the brain. Sudden loss of consciousness will occur.

3)Prolonged Exhaustion: Due to chronic illness, aging, weak constitution and excessive exertion can leads to Liver and kidney Yin deficiency below with Liver Yang rising. This is a complicated condition of deficiency below with excess above. In this circumstance the Qi and the Blood insurgent upward, following Liver Yang rising. Moreover, phlegm may follow and upwards to barricade the flow in the channels or cover the clear orifices.

3.6.2Identification of Patterns based on TCM and the ancient theory of Yin and Yang, the Five Elements, and the theory of the Qi

a) Identification of Patterns According to the Eight Principles and or Patterns

1. YIN/ YANG
2. FULL/EMPTY
3. INTERIOR/EXTERIOR
4. HOT/COLD

b) IDENTIFICATION OF PATHOLOGIES BASED ON THE SIX EXCESSES

The Six Excesses or Six Evils or Pathogenic Factors the also known as the and their characteristic clinical signs are:

1. **Wind:** wandering location of symptoms ,rapid onset of symptoms, , nasal congestion ,itching, tremor, paralysis, convulsion , "floating" pulse.

2. **Cold:** cold sensations, relief of symptoms by warmth aversion to cold, severe pain , watery/clear excreta, , abdominal pain, contracture/hyper tonicity of muscles, (slimy) white tongue fur,

Pulse :deep-hidden or string-like pulse, or slow pulse.

3. **Heat /Fire:** high fever, aversion to heat, thirst, concentrated urine, ,yellow tongue ,red face, red tongue, rapid pulse. Fire and heat are basically seen to be the same

4. **Dampness:** sensation of fullness, sensation of heaviness, greasy tongue fur symptoms of Spleen dysfunction, slippery pulse.

5. **Dryness:** dry cough, dry throat, dry lips ,dry mouth, nosebleeds, dry skin, dry stools.

6. **Summer heat:** either heat or mixed damp-heat symptoms.

Six-Excesses-patterns can consist of only one or a combination of Excesses (e.g., wind-cold, wind-damp-heat). They can also transform from one into another.

3.6.3PATTERN DIFFERENTIATION

1.Exterior Wind Invading into the Unsolicited Channels

Sudden weakness and numbness of the extremities, slurred speech, facial paralysis, drooling

or hemiplegia

Symptoms: fever, Aversion to wind, pain and soreness in the joints

Pulse: Floating and rapid

Tongue: Thin, white coat

2.**Wind Yang Disturbing Upwards with Liver and Kidney Yin Deficiency**

Sudden occurrence of facial paralysis, aphasia or slurred speech , heavy sensation and numbness of the extremities and hemiplegia

Symptoms: headache, vertigo and tinnitus, Dizziness, dream-disturbed sleep, dry throat, constipation and scanty dark urine, soreness and weakness of the lower back and knees,

Pulse: Wiry, thready and rapid, or wiry and slippery

Tongue: Red tongue with scanty or greasy coat

3.Heat Type of Closed Disorder

Rigid limbs, Sudden loss of consciousness with locked jaws, , and fecal and urinary retention as well as red face and fever, clenched fists

Symptoms: Tachypnea, bad breath, restlessness or agitation, excessive sputum or rattling sound in the throat,. Possible contractions and hiccoughs

Tongue: Red tongue with yellow greasy coat

Pulse: Wiry, slippery and forceful

Treatment Strategy: Clear heat from the Liver, extinguish wind and open the orifice

4.**Cold Type of Closed Disorder**

Sudden loss of consciousness with locked jaws, rigid limbs, clenched fists, and fecal and urinary retention as well as pale complexion and dark lips.

Symptoms: cold extremities, Quiet and still, excessive sputum and distention and fullness in the abdomen.

Pulse: Deep, slippery and decelerating

Tongue: White, greasy coat

5.Abandon Disorder

Sudden loss of consciousness with flaccid extremities, opened mouth, closed eyes, fecal and urinary incontinence **Tongue:** Flaccid Tongue

Pulse: Thready, we

Hemiplegia Associated with Qi Deficiency and Blood Stasis

Unilateral weakness, fatigue and lassitude, numbness or edema of the extremities and facial paralysis, loss of sensory and motor coordination.

Symptoms: Sallow complexion, poor appetite, loose stool and slurred speech

Pulse: Thready, choppy and weak

Tongue: Dark purple tongue w/ petechiae and white coat

7.Hemiplegia Associated with Yin Deficiency and Yang Rising

Unilateral contracture of the affected extremities, headache, and red flush on the face

Symptoms: Tinnitus, dysphasia ,Agitation, dizziness, and numbness of the extremities

Pulse: Wiry and forceful

Tongue: Red tongue with thin yellow coat

3.7 THE NATURE OF SCALP ACUPUNCTURE

Scalp acupuncture was formed as an independent and complete acupuncture system in early 1970 s. it is based on the theory of neuro anatomy , neuro physiology, and bio-holography principles of modern medicine.

Scalp acupuncture also different from body acupuncture which used the pathology of yin-yang five elements. And meridian as its basis according to traditional Chinese medicine .

In 1971, prof. jiao shunfa was the first to establish a modern acupuncture technique ,combining traditional needling methods with western medical knowledge of representative areas of cerebral cortex [40] Jiao's scalp acupuncture

Stems from the nervous system concept from western medicine

This acupuncture is used to stimulate specific scalp areas, such as the motor area, the sensory area, and the praxis area . Jiao's scalp areas, corresponding to the functional locations of the cerebral cortex, are used as the stimulated areas in scalp acupuncture for the treatment of diseases. Later, in 1976, Prof. Fang Yun Peng published another scalp acupuncture concept, which stipulated that the scalp was divided into seven zones and twenty-one acupoints. Other scalp acupuncture therapies that emerged included Prof. Tang Songyan's scalp acupuncture and Prof. Zhu Min-gqing's scalp acupuncture . Each of them used different diagrams and locations of scalp acupoints.

Then, in the 1960s, the Japanese surgeon Toshikatsu Yamamoto, MD, PhD, developed Yamamoto New Scalp Acupuncture (YNSA), which was based on somatotopic localization. YNSA involves five highly effective points, termed Basal points, and several other points named Sensory points, Brain points, Y points, and Extra points, which are all selected through abdominal or neck test zone palpation[41] .

Although there are numerous differences between Japanese and Chinese scalp acupuncture therapies, there are many common aspects in clinical indications and manipulating methods. A Standard Nomenclature of Scalp Acupuncture was promulgated by the World Health Organization (WHO) in 1989, and this nomenclature has been used since that time.[42]

In view of the standardization of scalp acupuncture, there is no doubt regarding its wide range of applications. Scalp acupuncture therapy during clinical treatment is required to achieve a certain amount of stimulation; therefore, scalp acupuncture is different from body acupuncture, which only uses De Qi to show that stimulation is occurring.

The selection of scalp acupoints relies on functional localization of the cerebral cortex, rather than traveling along the courses of meridians, as is done in body acupuncture.[43] In addition, al-though scalp acupuncture is widely used in clinical practice, there are few supportive scientific studies yet published. Thus, the aim of the present research was to

develop a hypothesis about the mechanism of scalp acupuncture that originates from neurophysiology and recent advances in neurobiology

Scalp acupuncture is one of several specialized acupuncture techniques with a specific body location, taking its place alongside ear, nose, hand, foot, and wrist/ankle acupuncture. The more general acupuncture therapy is often called body acupuncture.

Although the scalp has numerous traditionally-identified acupuncture points along several of the major meridians . modern scalp acupuncture differs from traditional acupuncture therapy. There are three basic features of scalp acupuncture that differentiate it from body acupuncture:

1. Treatment zones have been mapped onto the scalp that are associated with body functions and broad body regions. The zones include a few standard acupuncture points, but the treatment principle for point selection is usually not based on the traditional indication for the point or associated meridian. In general, within a defined zone, the forward part of the zone (nearer the face) is used to treat the upper body, while the rear portion of the zone is used to treat the lower body. Functional zones, such as sensory, memory, and motor, are usually located at the back and sides of the scalp.

2. In scalp acupuncture, the needles are to be inserted within a thin layer of loose tissue beneath the scalp surface, at a low angle of about 15–30 degrees, involving an insertion distance of about 1 cun [the cun is a variable unit of measure based on body size; about one inch for an adult]. Standard acupuncture of scalp points normally

involves subcutaneous insertion up to a depth 1/2 cun or less (about 0.3–0.5 inches for an adult) at a high angle of 60–90 degrees.

3. For scalp acupuncture, the needles are to be subjected to rapid stimulation, which may be carried out in a variety of ways, including pulling/thrusting, twirling, and electro-stimulation. Standard acupuncture applied to scalp points usually involves less rapid stimulation or moxibustion as the main stimulation technique. When using manual manipulation in modern scalp acupuncture, it is common to stimulate the needles for 2–3 minutes at a time, with a rest period of 5–10 minutes between stimulations.

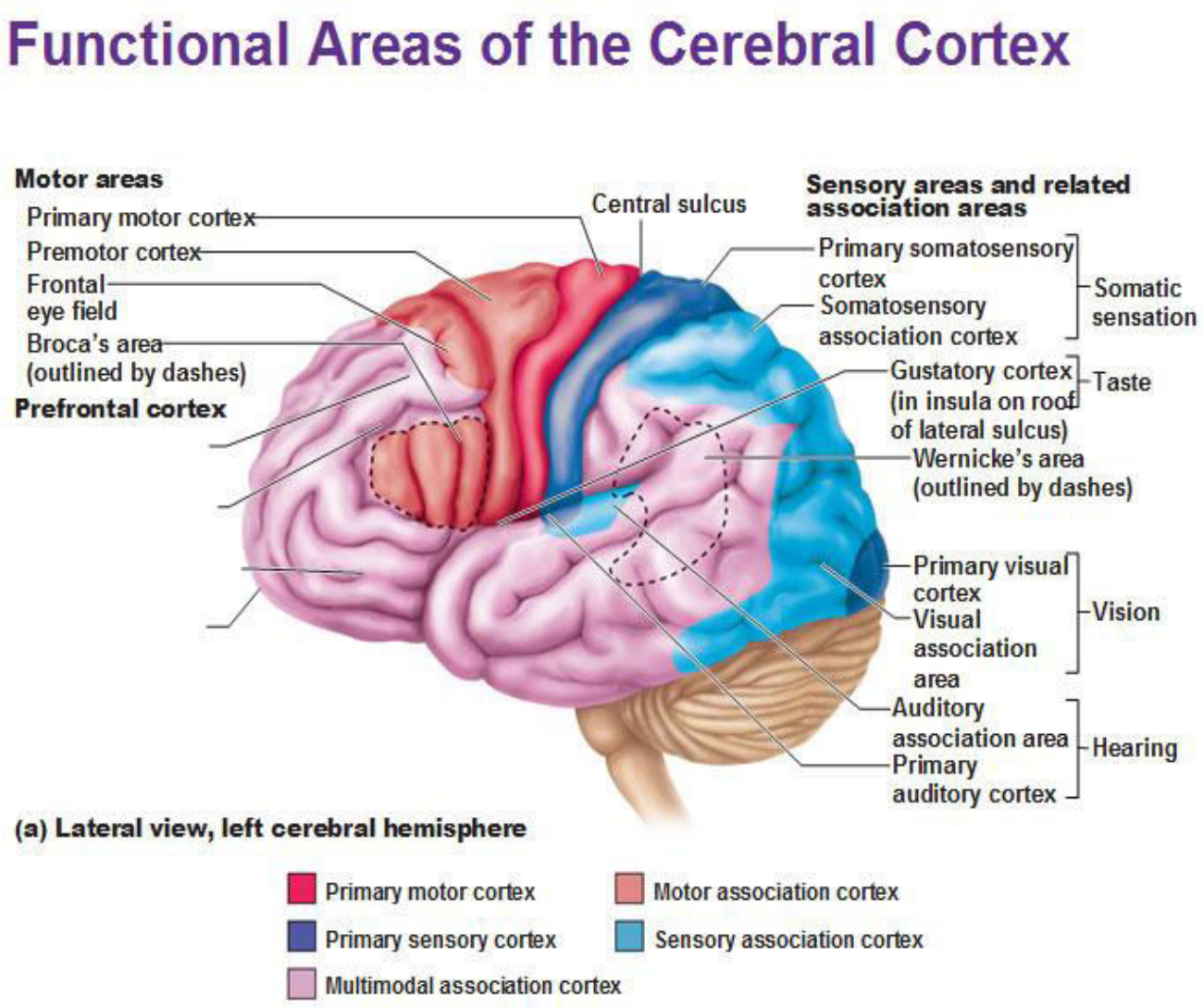


Fig 3.2 functional areas of cerebral cortex

Tab 3.1.Standard International Acupuncture Nomenclature.

English name and location	Alphanumeric
1.middle line of forehead 1 cun from GV24 straight down along the meridian	MS1
2.lateral line 1 of forehead 1 cun from BL3 straight down along the meridian	MS2
3.lateral line 2 of forehead 1 cun from GB15 straight down along themeridian	MS3
4.lateral line 3 of forehead 1 cun from the point 0.75 cun medial to ST8straight down	MS4
5.middle line of vertex from GV20 toGV21 along the midline of head	MS5
6.anterior oblique line of vertex- temporal from qiánshéncong (one of the four acupuncture points collectively designated as Ex-HN1, 1 cun anterior to GV20) obliquely toGB6	MS6
7.posterior oblique line of vertex-temporal from GV20 obliquely to GB7	MS7

8.lateral line 1 of vertex 1.5 cun lateral to middle line of vertex, 1.5 cun from BL6 backward along the meridian	MS8
9.Lateral line 2 of vertex 2.25 cun lateral to middle line of vertex, 1.5cun from GB17 backward along the meridian	MS9
10.anterior temporal line from GB4 toGB6	MS10
11.posterior temporal line from GB8 to GB7	MS11
12.upper-middle line of occiput from GV18 to GV17	MS12
13.upper-lateral line of occiput 0.5 cunlateral and parallel to upper-middle line of occiput	MS13
14.lower-lateral line of occiput 2 cun from BL9 straight down	MS14

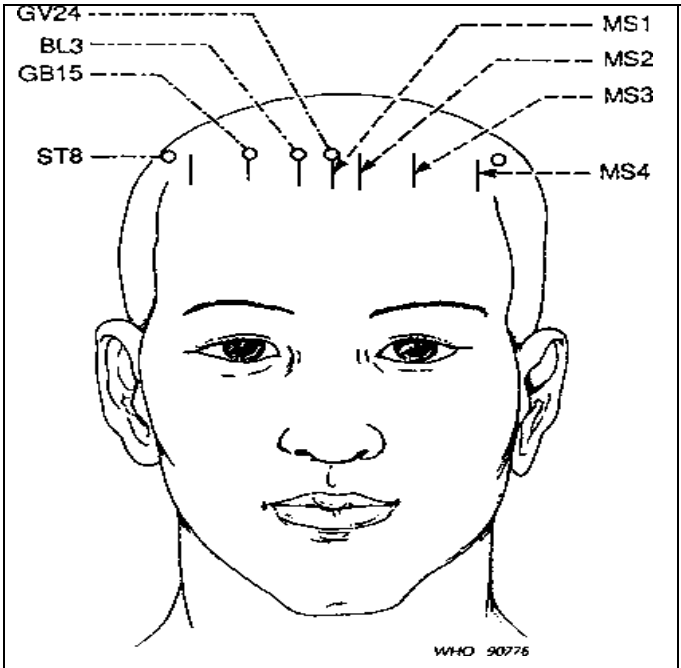


Fig. 3.3. Scalp acupuncture lines MS1, MS2, MS3 and MS4 (anterior view)

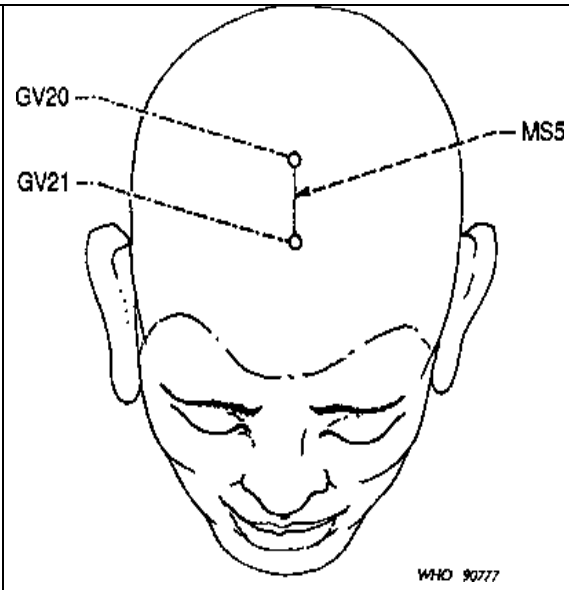


Fig. 3.4. Scalp acupuncture line MS5 (vertex view)

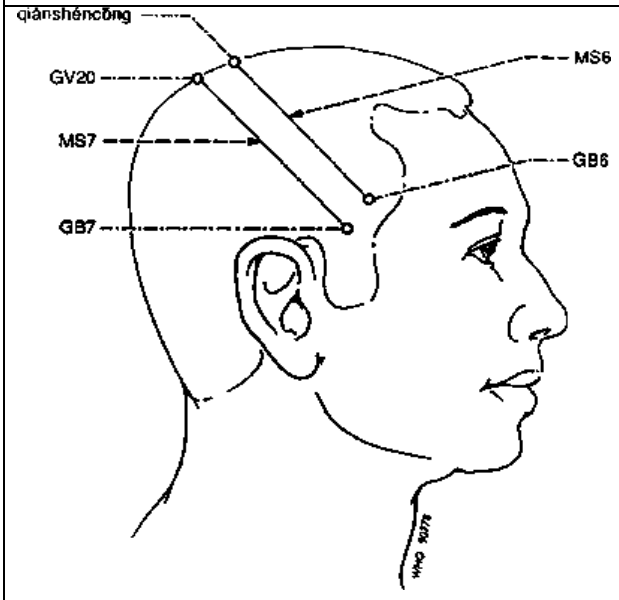


Fig. 3.5 Scalp acupuncture lines MS6 and MS7 (lateral view)

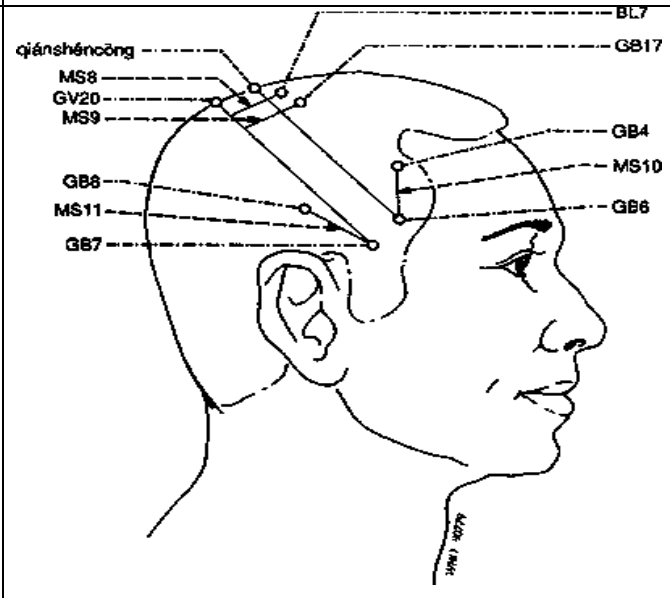


Fig. 3.6. Scalp acupuncture lines MS8, MS9, MS10 and MS11 (lateral view)

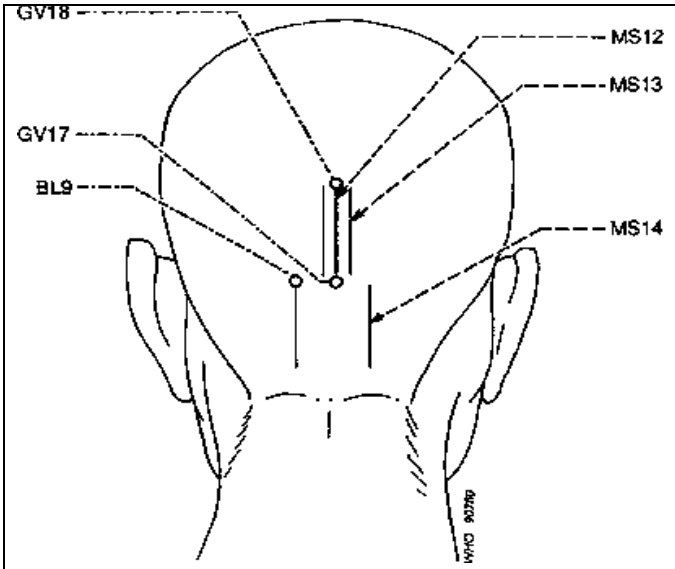


Fig. 3.7. Scalp acupuncture lines MS12, MS13 and MS14 (posterior view)

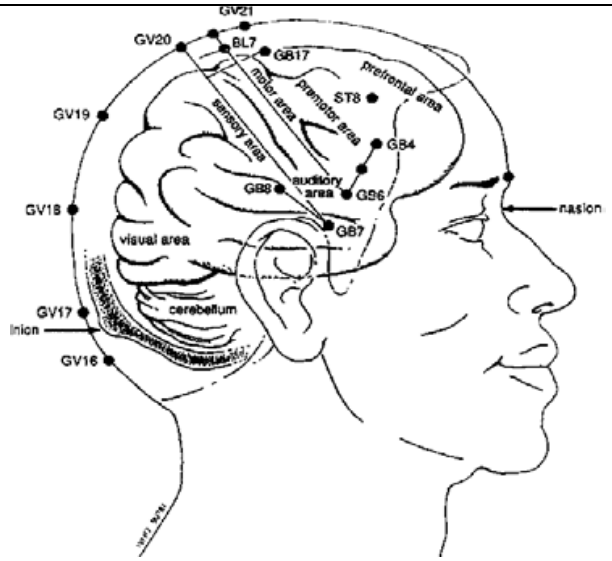


Fig. 3.8. Scalp acupuncture lines MS6, MS7, MS8, MS9, MS10 and MS11 superimposed on functional zones of the brain

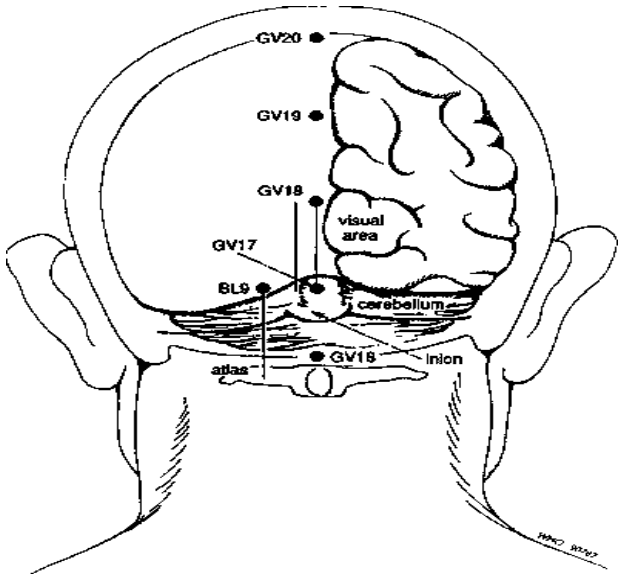


Fig.3.9. Scalp acupuncture lines MS12, MS13 andMS14 superimposed on functional zones of the brain

These scalp acupuncture lines were formerly named in functional terms. The proposed standard international nomenclature is based on surface anatomy so as to facilitate localization of the lines, but their relationship to the underlying functional structures has not changed

3.8.Clinical researches in scalp acupuncture for hemiplegia,

many studies have been conducted throughout the world, to find the effectiveness of scalp acupuncture for hemiplegia . in , zhen ci yan jiu 2018 published a systematic data mining-revealed characteristics of clinical application of scalp acupuncture in which 587 papers were reviewed and concluded that scalp acupuncture has superiority in the treatment disorders of the internal medicine and has been demonstrated to have positive effects for many types of problems, particularly for apoplexy and its sequelae.

rapid needle-propelling insertion and rapid needle-twirling technique are often employed.[44]another study on scalp acupuncture for of Pseudobulbar Paralysis by Yang Guo-rong et al.2006 they investigate the efficacy of scalp acupuncture in combination with body acupuncture for treating pseudobulbar paralysis and the concluded Scalp acupuncture in combination with body acupuncture has a good effect on pseudobulbar paralysis[45]

From reviewing these studies it is evident that scalp acupuncture is quiet promising therapy for hemiplegia But, still it requires improvisation in designing the study and standardization in application .

In a study of scalp acupuncture applied soon after following a stroke , it was said that both thromboxane B2 (TXB2) and 6-ketone prostaglandin F10 (6KP) levels in the blood plasma which affected. These biochemicals in the blood are the stable metabolites of substances helps in platelet clumping: thromboxane A2, which induces clumping of platelets and contraction of arteries, and prostaglandin I2, which inhibits platelet clumping and inhibits formation of arterial atheroma . (by reducing cell proliferation). It is shown that hemiplegic patients had higher plasma TXB2 levels and lower plasma 6KP levels than healthy persons. After acupuncture treatment on the stroke patients, the TXB2 levels declined and the 6KP levels rise. The change were statistically significant, though the parameters did not reach the levels of healthy patients. The improvements in TXB-6KP levels were interpreted as a biochemical manifestation of harmonizing yin and yang. The authors thought that the effect of acupuncture was mediated by the cerebral cortex and the nervous humoral system.

MATERIALS

AND

METHODS

4. MATERIALS AND METHODS

4.1.Subjects

60 patients with hemiplegia age group 30 to 60 years will participate in this study. . The subjects will be recruited from the Out-patient, in patient department of Government Yoga Medical College Hospital, Chennai.

After obtaining informed consent, . Participants (n = 60) who fit the inclusion and exclusion criteria will be randomly allocated into a experimental group (n = 30), control group (n = 30) . the experimental group will receive (scalp acupuncture drawing method)scalp acupuncture therapy, 20 minutes per day . 5 sittings per week. and no intervention for control group .

4.2.Description of the subjects including the selection of samples

The study subjects were conveniently recruited from the Government Yoga and Naturopathy Medical College and Hospital, Arumbakkam, Chennai District of Tamilnadu state in India. The subjects were recruited from the above mentioned hospital through screening done to assess diagnostic criteria, inclusion and exclusion criteria. All the sixty subjects were screened through a routine medical check-up and those satisfying the diagnostic criteria

4.3Ethical considerations

Ethical clearance

Ethical clearance was sought from the Institutional Ethical Committee prior to the start of the study and the approval for the same was granted.

4.4. Written Informed consent

Subjects who fulfilled inclusion criteria were appraised about the purpose of the study and rights as research subjects. Informed consent form was administered in English. Adequate time was given to each patient to go through the information sheet and their queries were answered. Their right to withdraw from the study and the need for willingness to participate voluntarily in the study was explained. All the subjects expressed their willingness to participate in the study by giving a signed informed consent.

(A sample information sheet and consent form is enclosed in Annexure)

4.5Inclusion and Exclusion criteria

4.5.1 Inclusion criteria

The following inclusion criteria would be the basis for selecting the subjects:

1)age between 30 to 60years

2) spastic hemiplegia due to stroke , confirmed by brain MRI.6month or longer before the enrollment;

3) The ability to comprehend the tasks required for the intervention.

4) clinically stable patients

5) All subjects gave their informed consent,

4.5.2.Exclusion Criteria:

1) comorbidities that would prohibit participation

in study procedures, including active renal dialysis, metastatic cancer, or extremity fracture within the past 6 months;

2) scar in the scalp needling area

3) enrollment in other studies that involved active interventions;

4) Cognitive impairment that would interfere with one's ability to give informed consent.

5)accident history

4.5 Study design

4.5.1 Type of the design

A randomized control trail

4.5.2 Randomization

Simple randomization was done using lottery method.

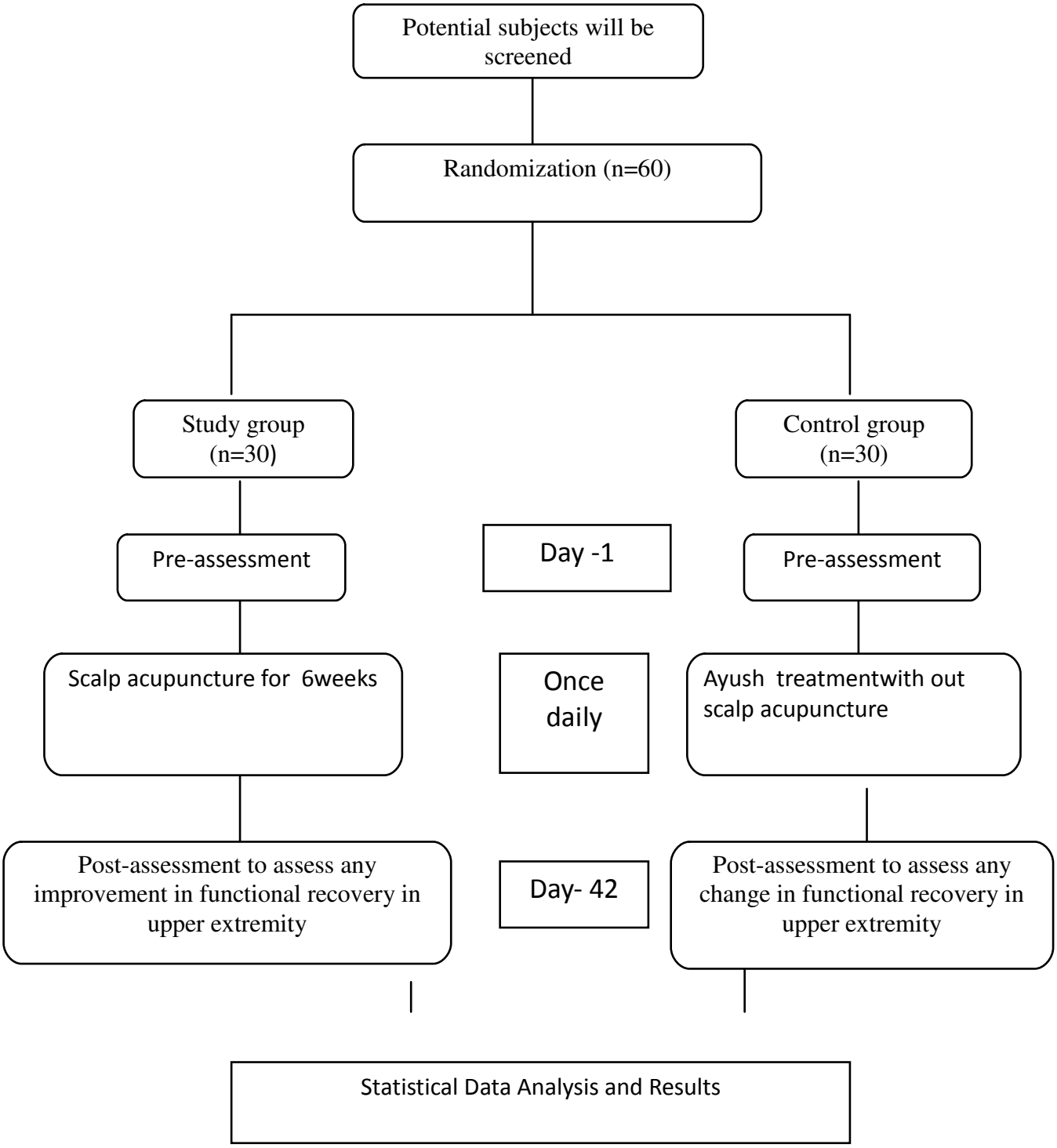
4.5.3 Allocation of patients into study and control groups

Patients were randomly allocated in Group A (scalp acupuncture group) and Group B (control group) in 1:1 ratio. 60 Subjects were initially screened and assigned to two groups.i.e., Group A (n= 30) and Group B (n= 30).

4.5.4.DATA COLLECTION

Outcome measures FMA , ARAT, SSQOL SCORES will be calculated at baseline (before intervention), 6th week end of the intervention ,

4.6.Study Plan



4.7.Assessments

The baseline and post-intervention assessments consisted of primary and secondary outcome variables.

4.7.1 Primary outcome variables

- Fugyl Meyer assessment upper extremity
- Action research arm test

4.7.2 Secondary outcome variables

- Stroke specific quality of life

All the 3 parameters measured before intervention.

4.8. PRIMARY OUTCOME MEASUREMENT

4.8.1FUGL-MEYER ASSESSMENT (FMA)

One of the most widely recognized and clinically relevant measures of body function impairment after stroke is the Fugl-Meyer (FM) assessment.Of its 5 domains (motor, sensory, balance, range of motion, joint pain), the motor domain, which includes an assessment of the upper extremity (UE) and lower extremity (LE), has well-established

reliabil- ity and validity as an indicator of motor impairment severity across different stroke recovery time points. Consistently, greater motor severity as indicated by lower UE and LE FM motor scores is correlated with lower functional ability, such as spontaneous arm use for feeding, dressing and grooming, or walking at functional gait speeds. Recently, a study using motor-evoked potentials and diffusion tensor imaging demonstrated that the Fugl-Meyer UE motor score was a reliable clinical measure.

Several rehabilitation intervention RCT have used the FM UE motor subscore either as the primary end point or as a stroke severity stratification variable.

The FMA scale for motor function was established as the first quantitative evaluative instrument for assessing sensorimotor stroke recovery, which contains an assessment of the upper extremities (UE, 33 items) and lower extremities (LE, 17 items)[46] . The FMA scale comprises of flexor synergy, extensor synergy, movement out of synergy, movement combining synergies, wrist, hand, and co-ordination/speed.
The motor FM assessments are counted on a 3-point ordinal scale (0–2). Each item can be separated into three levels, the lowest level being 0 point, the highest being 2 points, and level between the two specified with 1 point. The FMA motor assessment is used to measure voluntary limb movement. It the UE subscale (33 items; score range 0–66) and the LE subscale (17 items; score range 0–34) for a total motor FM score of 100 [46]

The assessment is done in a peaceful area when the patient is extremely alert. The motor domain has well-established reliability and validity as an indicator of motor impairment severity across different stroke recovery time points[47,48.] The clinical value of the FMA assessment is that it offers a hierarchical scale of motor impairment severity; low FMA scores reveals greater impairment. A higher FMA score for the UE or LE is a indicator of less motor impairment [49,50.] The minimum clinically important difference (MCID) values [51,52]of the Chinese version of the FMA in motor domain in patients with stroke are 4.58 for UE, 3.31 for LE, and 6.0 for UE plus LE [53.] We set up a consistent procedure for the FMA motor assessments, an adequate training program, and a proficiency assessment for study raters to confirm rater competence across the duration of the trial.

.The FMA will be measured at baseline, during the interventions period (at 6weeks end of the intervention),

4.8.2THE ACTION RESEARCH ARM TEST:

Fig 4.1. tools needed for action research arm test

(ARAT) is a harmonized ordinal scale that asses upper-extremity (arm and hand) function.[54]The ARAT is based on the assumption that complex upper-extremity actions used in daily life could be explained and measured by 4 basic movements: grasp, grip, pinch, and gross movements of extension and flexion at the elbow and shoulder . Thistest evaluates the ability to lift different sized objects to a height of 37.5cm (14.75in), transfer cylindrically shaped objects to a distance of 37.5cm, use pinch grasp to lift different sized objects (eg, a ball bearing, a marble) between third finger and thumb, and perform 3 gross upper-extremity movements Each upper extremity is estimated individually.[55]

the patient must first try to do the most difficult task in a sub scale. If the maximum score (score = 3) is obtained for this task then the maximum score for this entire subscale should be assigned, and the evaluator should move to the next subscale to be administered.

When the client is unable to complete the most difficult item (scoring between 0-2), then the easiest item in this specific subscale should be performed. If the client fails completely (score = 0) when performing the easiest task, then the other intermediate items must not be tested, the entire subscale should be scored as zero, and the evaluator should then move to the next subscale. if the client finished the easiest task either

partially (score = 1 or 2) or completely (score = 3), then all the other tasks in that same subscale should be tested before moving to the next subscale.

Following these rules, the items administered will range from a minimum of 4 to a maximum of 19 (van der Lee, Roorda, & Lankhorst, 2002).[56]

The ARAT is graded on a 4-point scale (57 points maximum for each upper extremity): 3 points if the task is completed normally; 2 points if the task is done but takes an abnormally long time, is performed with great struggle, or is performed with poorly coordinated movements; 1 point if the task is only partially completed; and 0 points if the task is not performed at all. The ARAT has high reliability and validity and can be completed in 8 to 10 minutes. Its main benefit is its ability to assess a wide range of upper-extremity functions after stroke.

4.8.3.THE STROKE-SPECIFIC QUALITY OF LIFE SCALE

The Stroke-Specific Quality of Life scale (SSQOL) was established in 1999 as a patient-centered outcome in stroke research to replenish the use of more generic quality of life (QOL) measures.[57] It has 12 domains that covering traditional health-related QOL topics (e.g., social and psychological measures) and stroke specific topics (e.g., language, mobility, vision, and upper extremity function).[58] The scale has been shown to have high internal reliability and construct validity in patients with different stroke types.'

A drawback to the original SSQOL is subject burden. For this reason, a 12-item version was developed and validated among patients in the Netherlands with mixed cerebrovascular disorders. In this study, the 12-item SSQOL explained 91–93% of the variance of the 49-item SSQOL in the validation samples. Lacking however is further validation of the shortened version specifically in ischemic stroke patients from other race-ethnic backgrounds[59]

4.9INTERVENTION

Scalp acupuncture treatment

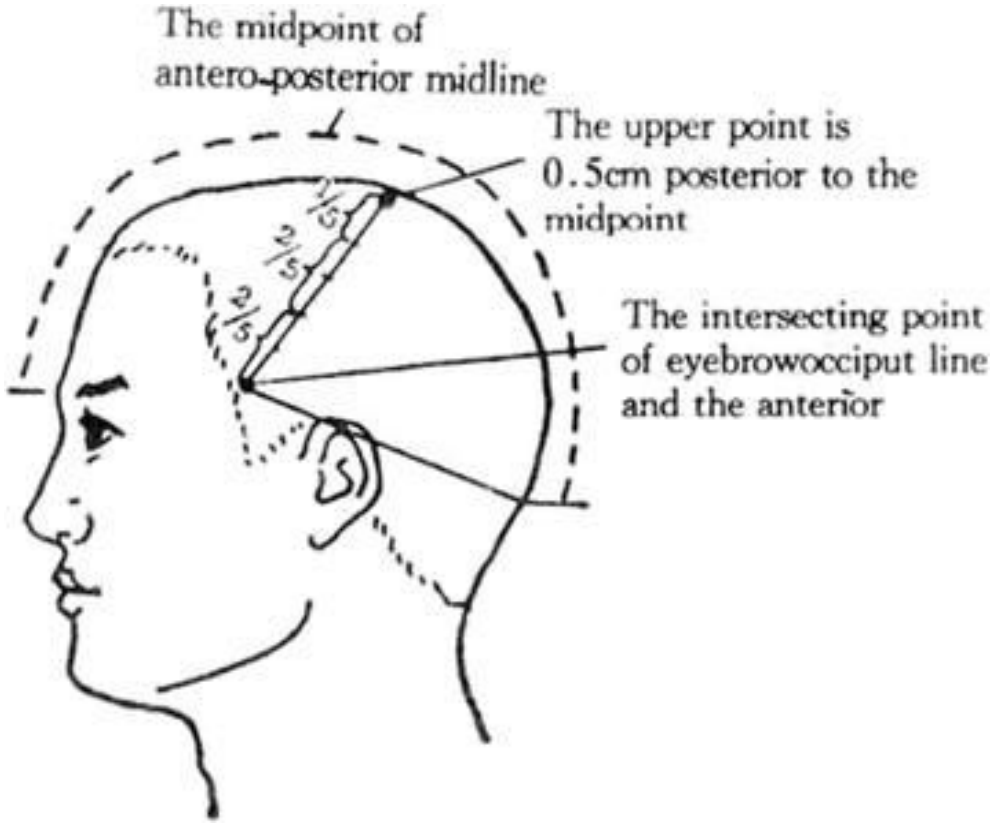
The scalp acupuncture intervention complies with the Standards for Reporting Interventions in Clinical Trials of Acupuncture (STRICTA) guidelines. Moreover, all the acupuncturists will receive special training to achieve a sound understanding of the acupuncture intervention and to normalize the practices across different acupuncturists. The trial adheres to the STRICTA guidelines [60].

The parameters for scalp acupuncture are set as follows:

Location of the motor area of Jiao's scalp acupuncture: This area is located over the anterior central convolution of the cerebral cortex. It is a line starting from a point (known as the upper point of the motor area) 0.5 cm posterior to the midpoint of

theanterior-posterior midline of the head and stretching diagonally to the juncture between the eyebrow-occipital line and the anterior border of the corner of the temporal hairline, which is indistinct. Draw a vertical line upwards from the middle point of the zygomatic arch to the eyebrow-occipital line; the intersection of the two lines is the projection of the motor area. The motor area is divided into five equal parts: the upper one-fifth being the motor area of the lower limbs and the trunk, the middle two-fifths being the motor area of the upper limbs, and the lower two fifths the motor area of the face (Fig. 4.1) shows the motor area of Jiao's scalp acupuncture). The motor area of the cerebral infarction lesion's side is selected as the site for acupuncture treatment.

Fig 4.2 motor area of scalp acupuncture



In scalp acupuncture, the needles are to be inserted within a thin layer of loose tissue beneath the scalp surface, at a low angle of about 15–30 degrees, involving an insertion distance of about 1 cun [the cun is a variable unit of measure based on body size; about one inch for an adult]. Standard acupuncture of scalp points normally involves subcutaneous insertion up to a depth 1/2 cun or less (about 0.3–0.5 inches for an adult) at a high angle of 60–90 degrees.

The needle size often stated in Chinese textbooks for scalp acupuncture is 26, 28, or 30 gauge, which is appropriate for rapid twirling techniques. For scalp needle stimulation technique (thrust and pull method), a somewhat finer needle gauge of 32 or 34 is appropriate for most cases, and the insertion length is around 1 cun. A 30 mm (1.2 inch) needle with a wound head is thought to be the best. The needle must be long enough so that it is not implanted up to the handle, but short enough that there will not be any bending during insertion and manipulation. The angle of insertion is typically 15–25 degrees. The patient should not feel discomfort, though there are some infrequently used scalp points along the sides of the head, stated above, that typically create pain.

The needle is inserted along the practitioner's nail pressing the skin. Press besides the treatment zones with the nail of the thumb and first finger of the left hand, hold the needle with the right hand, and keep the needle tip closely against the nail. By avoiding the hair follicle, one can minimize pain during insertion. The focus of needling is usually based on the mapping of the body within the zone being treated: the needle is intended

(along the line of the zone) toward that portion of the zone most closely corresponding to the area of the body that is affected by the injury or disease.

Although the space from the skin surface to the skull is very small, there are several tissue layers: the skin, hypodermis, galea aponeurotica and occipito-frontalis muscles, subaproneurotic space, and pericranium. The sub aproneurotic space is a loose layer of connective tissue that is ideal for penetration during scalp needling: the needle slides in smoothly and does not cause pain, yet the desired needling sensation is strong. If the angle of needling is too shallow, the needle will penetrate the skin and muscle layers and it will be difficult to get a smooth insertion.

Acupuncture manipulation: Disposable stainless-steel needles (size 0.25 mm × 40 mm, will be manually inserted at an approximately 15-degree angle to a depth of 1.0–1.5 cm respectively along the upper point and middle point of the motor area on the scalp. For treating motor dysfunction, the needles will be rotated for at least 200 revolutions per minute for 1 minute every 10 minutes for a total of 60 minutes. Scalp acupuncture treatment will be performed by an independent certified practitioner (acupuncturist) with 5 years of clinical experience.

There are two basic methods of needling ,for manipulating the QI, designated jinqi and chouqi, that have been elucidated by either physician . Both are based on older techniques and involve rapid, short distance movements. Jinqi (jin means move forward) is a

tonifying, thrusting method. “Thrust the needle quickly with violent force, but the body of the needle does not move, or no more than 0.1 cun in. “Following the thrust, the needle is allowed to settle back to its original position”. Chouqi (chou means to withdraw) is a sedating, reducing method. It is based on forceful movement and a lifting motion. “Lift the needle quickly with violent force, but the body of the needle does not move or no more than 0.1 cun out” Again, after the pull, the needle settles back to its original position.

Treatment course: The scalp acupuncture treatment will be implemented five times a week, thirty times per treatment course, with each patient having two treatment courses in total.

RESULTS

5.RESULTS

All variables were examined for outliers and non-normal distributions. The Categorical variables were expressed as Frequency and percentage. The Quantity variables were expressed as mean and standard deviation. Descriptive statistics were used to evaluate baseline characteristics.

The group comparisons for the categorical variables were analyzed using Chi square test and for quantity variables were analyzed using student ‘t’ test. Intra group comparison were analyzed using paired t test and inter group comparison were analyzed using independent t test.

The p value of less than 0.05 was considered as statistically significant. The statistical analysis was carried out using open source statistical software R.

Demographic characteristics of the study subjects

Control

Sex	Frequency	Percentage
Female	6	20
Male	24	80
Total	30	100

Table – 5.1

Scalp

Sex	Frequency	Percentage
Female	8	27
Male	22	73
Total	30	100

Table – 5.2

Sex	Control	Scalp	Total	Chi Square	P Value
Female	6 (20%)	8 (27%)	14	0.373	0.542
Male	24 (80%)	22 (73%)	46		
Total	30	30	60		

Table – 5.3

Patient Characteristics	Control	Scalp	P Value
Age (years)*	46.77+ 8.15	46.97 + 7.65	0.122
Sex (Male/Female)	24/6	22/8	0.542

Table – 5.4

* values are expressed as mean $\pm$ s.d

There is no significance difference between the age distribution among the control group and scalp groups.

There is no significance difference between the age distribution among the control group and scalp groups

Pre test

	Control	Scalp	Independent 't' test p value
FMA	23.57 ± 3.3	24.30 ± 5.4	0.526
ARAT	16.13 ± 2.6	16.20 ± 3.3	0.932
SSQOL	98.57 ± 6.7	100.20 ± 6.1	0.331

Table – 5.5

There was a no significant difference in the FMA pre test for control (23.57 ± 3.3) and scalp groups (24.30 ± 5.4) with a p value of 0.526.

There was a no significant difference in the ARAT pre test for control (16.13 ± 2.6) and scalp groups (16.20 ± 3.3) with a p value of 0.932.

There was a no significant difference in the SSQOL pre test for control (98.57 ± 6.7) and scalp groups (100.20 ± 6.1) with a p value of 0.331.

Post Test

	Control	Scalp	Independent 't' test p value
FMA	27.93 ± 3.75	34.53 ± 5.8	0.001
ARAT	18.73 ± 2.5	21.67 ± 3.5	0.001
SSQOL	103.33 ± 7.3	114.27 ± 8.06	0.001

Table – 5.6

There was a significant difference in the FMA post test for control (27.93 $\pm$ 3.75) and scalp groups (34.53 $\pm$ 5.8) with a p value < 0.05.

There was a significant difference in the ARAT post test for control (18.73 $\pm$ 2.5) and scalp groups (21.67 $\pm$ 3.5) with a p value < 0.05

There was a significant difference in the SSQOL post test for control (103.33 $\pm$ 7.3) and scalp groups (114.27 $\pm$ 8.06) with a p value < 0.05.

FMA

	Pre Test	Post Test	Paired t test p value
Control	23.57 + 3.30	27.93 + 3.75	0.001
Scalp	24.30 + 5.36	34.53 + 5.82	0.001

Table – 5.7

There was a significant difference in the FMA for control (27.93 $\pm$ 3.75) and scalp groups (34.53 $\pm$ 5.8) with a p value < 0.05. These results suggest that the patients undergone scalp treatment, the FMA score increases.

	Pre Test	Post Test	Paired t test p value
Control	23.57 + 3.30	27.93 + 3.75	0.001
Scalp	24.30 + 5.36	34.53 + 5.82	0.001

Table 5.8

There was a significant difference in the FMA for control (27.93 $\pm$ 3.75) and scalp groups (34.53 $\pm$ 5.8) with a p value < 0.05. These results suggest that the patients undergone scalp treatment, the FMA score increases.

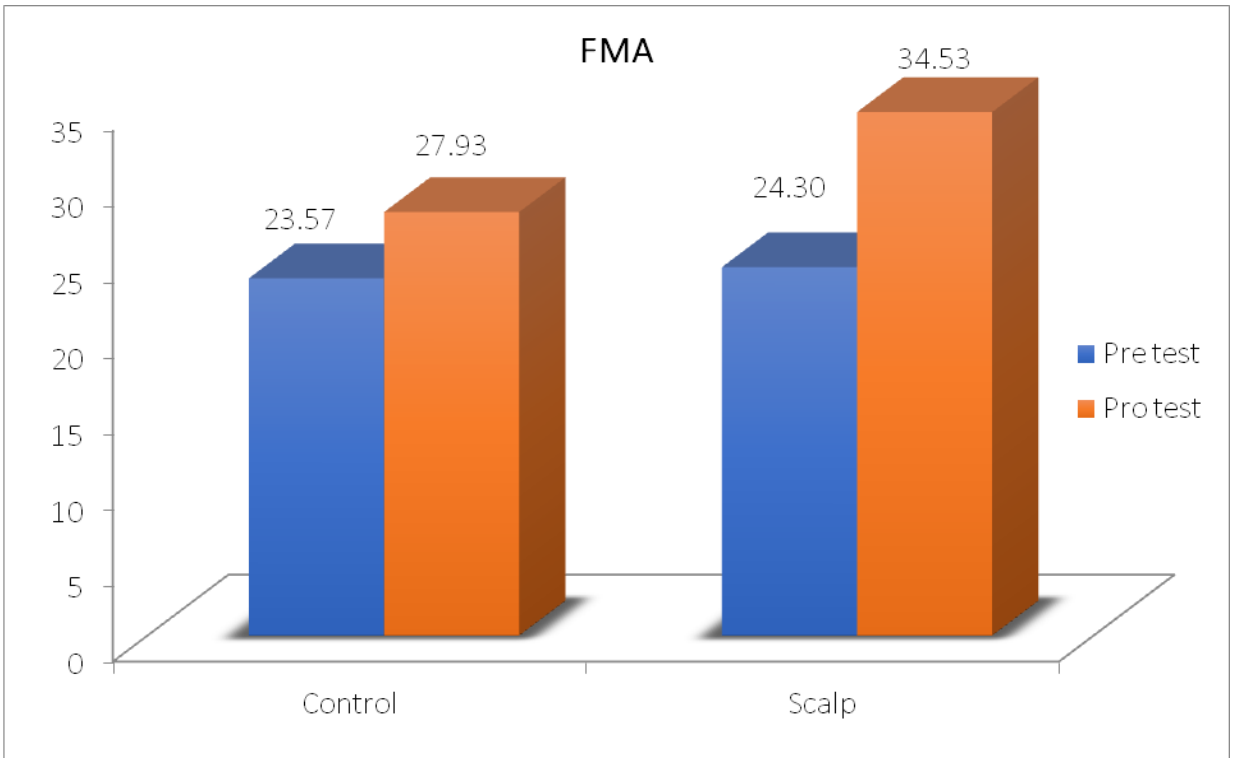


FIG 5.1

ARAT

	Pre Test	Post Test	Paired t test p value
Control	16.13 + 2.65	18.73 + 2.45	0.001
Scalp	16.20 + 3.34	21.67 + 3.45	0.001

Table 5.9

There was a significant difference in the ARAT for control (18.73 $\pm$ 2.5) and scalp groups (21.67 $\pm$ 3.5) with a p value $<$ 0.05. These results suggest that the patients undergone scalp treatment, the ARAT score increases.

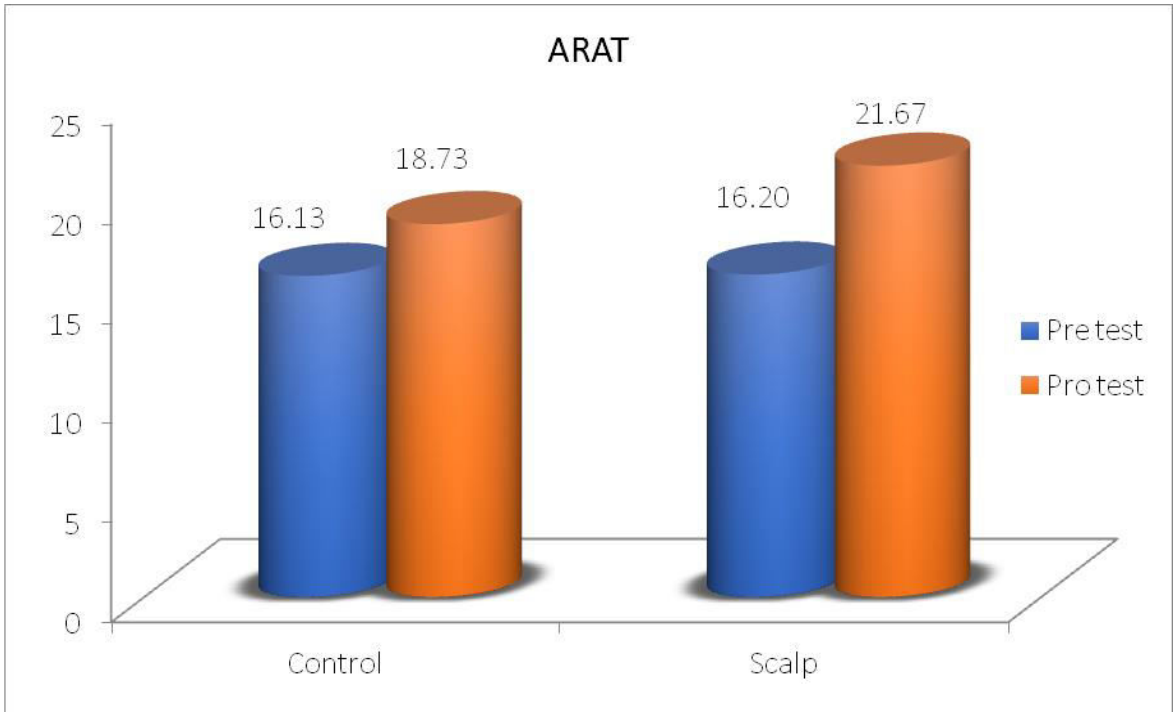


Fig 5.2

SSQOL

	Pre Test	Post Test	Paired t test p value
Control	98.57 ± 6.75	103.33 ± 7.26	0.001
Scalp	100.20 ± 6.13	114.27 ± 8.06	0.001

Table – 5.10

There was a significant difference in the SSQOL for control (103.33 ± 7.3) and scalp groups (114.27 ± 8.06) with a p value < 0.05. . These results suggest that the patients undergone scalp treatment, the SSQOL score increases.

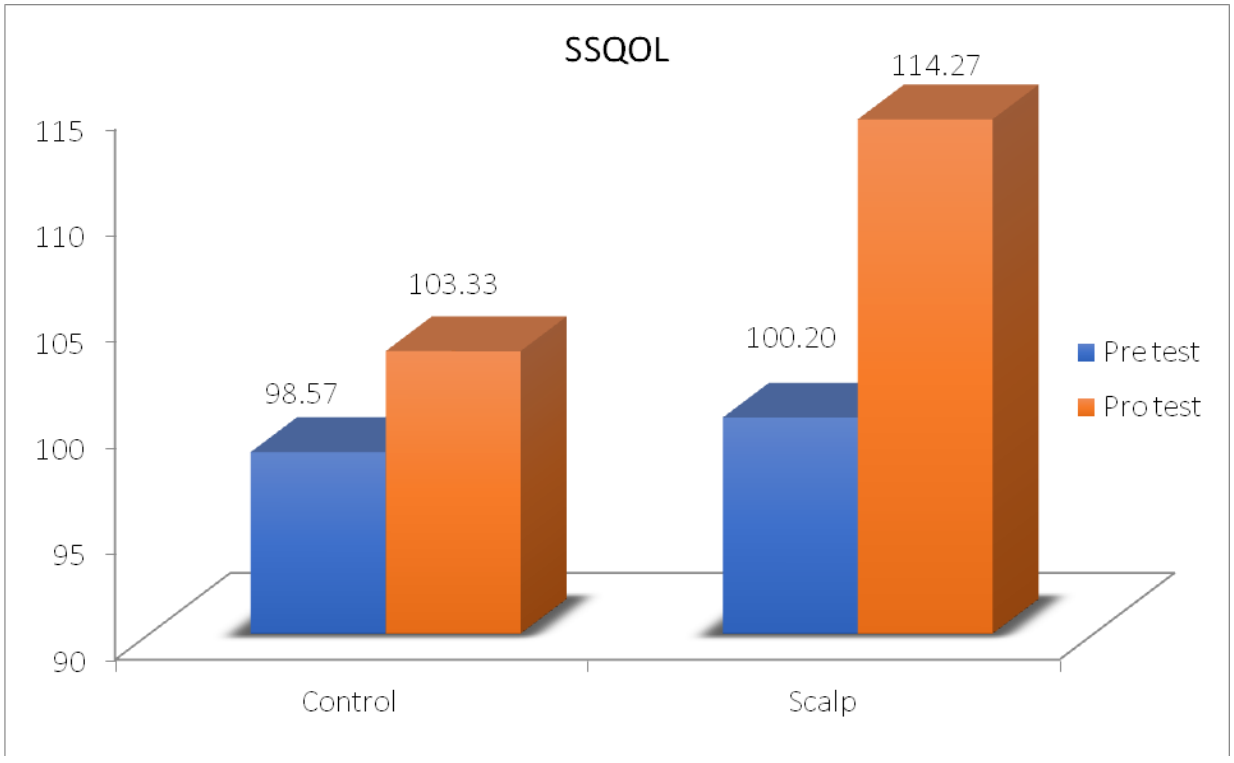


Table 5.11

DISCUSSION

DISCUSSION

Chinese scalp acupuncture is a contemporary acupuncture technique integrating TCM method of needling & allopathic medical knowledge of representative areas of the cerebral cortex. As scalp acupuncture was developing, various researches began to introduce western neuro-physiology into the field of scalp acupuncture and explored correlations between the brain and human body. Dr. Jiao unite the modern understanding of neuro-anatomy and neurophysiology with the TCM concept of acupuncture to develop the new scalp acupuncture utilized to affect the functions of the central nervous system (CNS).

SA uses special techniques to synchronize and regulate the functional activities of the brain and body. Previous researches on scalp acupuncture have indicated positive results in treating various disorders of the central nervous system. Hemiplegia is one of the most common neurological diseases which acupuncture treatment is recommended, according to the WHO

In this study we use, middle two-fifths of the motor area on the scalp was selected as the primary area for the scalp acupuncture stimulation region.

In hemiplegic rehabilitation clinical studies, upper extremity functional recovery plays an important role. To evaluate the upper extremity functional recovery FMA and ARAT were selected as the gold standards for the evaluation.

We used the FMA scale to best analyze the motor ability of stroke patients based on the environments & the corresponding instructions;

The FMA reproduces the motor dysfunction level of stroke patients and is widely applied in the evaluation of functional recovery of hemiplegia . The ARAT was used as an individual assessment scale to evaluate daily life activities of stroke patients; it responds to the complex activity ability and necessary functional skills of patients.

Effect of scalp acupuncture among hemiplegic patients on outcome measures on upper extremity functional recovery:

Table (5.4) reveals there is no significance between the age distribution among the control group and scalp group($p>.122$). this shows uniformity of the age group and is not significance difference between the both control group and scalp acupuncture groups.

Table 5.5 clearly indicates that there was a no significant difference in the FMA pretest for control (23.57 ± 3.3) and scalp groups (24.30 ± 5.4) with a p value of 0.526. There was a no significant difference in the ARAT pre test for control (16.13 ± 2.6) and scalp groups (16.20 ± 3.3) with a p value of 0.932.

There was a no significant difference in the SSQOL pretest for control (98.57 ± 6.7) and scalp groups (100.20 ± 6.1) with a p value of 0.331. This value shows uniformity of the selection criteria of the subjects for the study.

Table 5.7. There was a significant difference in the FMA for control (27.93 $\pm$ 3.75) and scalp groups (34.53 $\pm$ 5.8) with a p value < 0.05. These results suggest that the patients undergone scalp treatment, the FMA score increases. These values observes the value between the pre and post *fugyl* Meyer assessment for upper extremity is significant in both groups. Though scalp acupuncture group showed better change than control group. Similar results were found in another study conducted in Yueyang Hospital of Integrated Medicine, Shanghai University of Traditional Chinese Medicine in China. They concluded that there is, improvement in the muscle tension of the distal upper and proximal lower limbs, as represented by the variation in the H_{max}/M_{max} ratio, appears to be important for motor function recovery from hemiplegia. Furthermore, scalp acupuncture has a bidirectional effect on muscle tension in hemiplegic limbs.61

Another study by zhen Ci Yan Jiu. 2012 also stat FMA score will significantly increase in Scalp acupuncture combined with body acupuncture can evidently improve limb movement function and reduce the nerve function damage in stroke patients.[62]

Overall, the scalp acupuncture intervention for 6 weeks in chronic hemiplegic patients resulted in the improvement of upper extremity functional recovery .scalp acupuncture intervention improve the stroke specific quality of life score and improve the quality of living with hemiplegia.

LIMITATIONS OF THE STUDY

1. Sample size was small

2. The study was conducted for short duration i.e. 6 weeks

3. This study is specified only on upper extremity functional recovery only

RECOMMENDATION FOR FURTHER STUDY

1. Studies to show the underlying mechanisms of scalp acupuncture in hemiplegic subjects.

2. Study can be conducted in larger groups and longer duration

3. long term follow up study can be conducted to understand the sustained effect of habit.

CONCLUSION

7. CONCLUSION

This study has concluded that scalp acupuncture is effective in improve the upper extremity functional recovery in chronic hemiplegic patients. When compared to control group scalp acupuncture have the most success in improve the upper extremity functional recovery in chronic hemiplegic subjects. This study demonstrates that the methods of scalp Acupuncture are more subtle and needs deeper understanding as it is uncertain to implement without proper knowledge. scalp acupuncture provides an important complementary/alternative treatment approach for improving many symptoms of hemiplegic patient's and showing progression in quality of life after stroke and lowering physical disabilities and reducing the number of relapses

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Appendix 1

INFORMED CONSENT FORM

Title of the study:“ “EFFECT OF SCALP ACUPUNCTURE ON UPPER EXTREMITY FUNCTIONAL RECOVERY IN CHRONIC HEMEPLEGIA.”.”
Name of the Participant:
Name of the Principal Investigator: Dr.K.VENKATESAN.
Name of the Institution: Government Yoga & Naturopathy Medical College,
Chennai – 600 106

Documentation of the informed consent

I _____ have read the information in this form (or it has been read to me). I was free to ask any questions and they have been answered. I am over 18 years of age and, exercising my free power of choice, hereby give my consent to be included as a participant in**:“ “**
EFFECT OF SCALP ACUPUNCTURE ON UPPER EXTREMITY FUNCTIONAL RECOVERY IN CHRONIC HEMEPLEGIA.”.”

1. I have read and understood this consent form and the information provided to me.
2. I have had the consent document explained to me.
3. I have been explained about the nature of the study.
4. I have been explained about my rights and responsibilities by the investigator.
5. I have been informed the investigator of all the treatments I am taking or have taken in the past _____ months including any native (alternative) treatment.
6. I have been advised about the risks associated with my participation in this study.
7. I agree to cooperate with the investigator and I will inform him/her immediately if I suffer unusual symptoms.
8. I have not participated in any research study within the past _____month(s).
9. I am aware of the fact that I can opt out of the study at any time without having to give any reason and this will not affect my future treatment in this hospital.
10. I am also aware that the investigator may terminate my participation in the study at any time, for any reason, without my consent.

12. I hereby give permission to the investigators to release the information obtained from me as resultof participation in this study to the sponsors, regulatory authorities, Govt. agencies, and IEC. Iunderstand that they are publicly presented.

13. I have understood that my identity will be kept confidential if my data are publicly presented.
14. I have had my questions answered to my satisfaction.
15. I have decided to be in the research study.
I am aware that if I have any question during this study, I should contact the investigator. By signingthis consent form I attest that the information given in this document has been clearly explained to meand understood by me, I will be given a copy of this consent document.

For adult participants:

Name and signature / thumb impression of the participant (or legal representative if participant incompetent)

Name _____ Signature_____

Date_____

Name and Signature of impartial witness (required for illiterate patients):

Name _____ Signature_____

Date_____

Address and contact number of the impartial witness:

Name and Signature of the investigator or his representative obtaining consent:

Name _____ Signature_____

Date_____

FUGL-MEYER ASSESSMENT UPPER EXTREMITY (FMA-UE) Assessment of sensorimotor function

ID:
Date:
Examiner:

A. UPPER EXTREMITY, sitting position

I. Reflex activity	none	can be elicited
Flexors: biceps and finger flexors (at least one)	0	2
Extensors: triceps	0	2
Subtotal I (max 4)		

II. Volitional movement within synergies, without gravitational help			none	partial	full
Flexor synergy: Hand from contralateral knee to ipsilateral ear. From extensor synergy (shoulder adduction/ internal rotation, elbow extension, forearm pronation) to flexor synergy (shoulder abduction/ external rotation, elbow flexion, forearm supination). **Extensor synergy:** Hand from ipsilateral ear to the contralateral knee	Shoulder	retraction	0	1	2
		elevation	0	1	2
		abduction (90°)	0	1	2
		external rotation	0	1	2
	Elbow	flexion	0	1	2
	Forearm	supination	0	1	2
	Shoulder	adduction/internal rotation	0	1	2
	Elbow	extension	0	1	2
	Forearm	pronation	0	1	2
Subtotal II (max 18)					

III. Volitional movement mixing synergies, without compensation		none	partial	full
Hand to lumbar spine hand on lap	cannot perform or hand in front of ant-sup iliac spine	0		
	hand behind ant-sup iliac spine (without compensation)		1	
	hand to lumbar spine (without compensation)			2
Shoulder flexion 0°- 90° elbow at 0° pronation-supination 0°	immediate abduction or elbow flexion	0		
	abduction or elbow flexion during movement		1	
	flexion 90°, no shoulder abduction or elbow flexion			2
Pronation-supination elbow at 90° shoulder at 0°	no pronation/supination, starting position impossible	0		
	limited pronation/supination, maintains starting position		1	
	full pronation/supination, maintains starting position			2
Subtotal III (max 6)				

IV. Volitional movement with little or no synergy		none	partial	full
Shoulder abduction 0 - 90° elbow at 0° forearm pronated	immediate supination or elbow flexion	0		
	supination or elbow flexion during movement		1	
	abduction 90°, maintains extension and pronation			2
Shoulder flexion 90° - 180° elbow at 0° pronation-supination 0°	immediate abduction or elbow flexion	0		
	abduction or elbow flexion during movement		1	
	flexion 180°, no shoulder abduction or elbow flexion			2
Pronation/supination elbow at 0° shoulder at 30°- 90° flexion	no pronation/supination, starting position impossible	0		
	limited pronation/supination, maintains start position		1	
	full pronation/supination, maintains starting position			2
Subtotal IV (max 6)				

V. Normal reflex activity assessed only if full score of 6 points is achieved in part IV; compare with the unaffected side		0 (IV), hyper	lively	normal
biceps, triceps, finger flexors	2 of 3 reflexes markedly hyperactive or 0 points in part IV	0		
	1 reflex markedly hyperactive or at least 2 reflexes lively		1	
	maximum of 1 reflex lively, none hyperactive			2
Subtotal V (max 2)				
Total A (max 36)				

B. WRIST support may be provided at the elbow to take or hold the starting position, no support at wrist, check the passive range of motion prior testing		**none**	**partial**	**full**
Stability at 15° dorsiflexion elbow at 90°, forearm pronated shoulder at 0°	less than 15° active dorsiflexion dorsiflexion 15°, no resistance tolerated maintains dorsiflexion against resistance	0	1	2
Repeated dorsifexion / volar flexion elbow at 90°, forearm pronated shoulder at 0°, slight finger flexion	cannot perform volitionally limited active range of motion full active range of motion, smoothly	0	1	2
Stability at 15° dorsiflexion elbow at 0°, forearm pronated slight shoulder flexion/abduction	less than 15° active dorsiflexion dorsiflexion 15°, no resistance tolerated maintains dorsiflexion against resistance	0	1	2
Repeated dorsifexion / volar flexion elbow at 0°, forearm pronated slight shoulder flexion/abduction	cannot perform volitionally limited active range of motion full active range of motion, smoothly	0	1	2
Circumduction elbow at 90°, forearm pronated shoulder at 0°	cannot perform volitionally jerky movement or incomplete complete and smooth circumduction	0	1	2
	Total B (max 10)			

C. HAND support may be provided at the elbow to keep 90° flexion, no support at the wrist, compare with unaffected hand, the objects are interposed, active grasp		**none**	**partial**	**full**
Mass flexion from full active or passive extension		0	1	2
Mass extension from full active or passive flexion		0	1	2
GRASP				
a. Hook grasp flexion in PIP and DIP (digits II-V), extension in MCP II-V	cannot be performed can hold position but weak maintains position against resistance	0	1	2
b. Thumb adduction 1-st CMC, MCP, IP at 0°, scrap of paper between thumb and 2-nd MCP joint	cannot be performed can hold paper but not against tug can hold paper against a tug	0	1	2
c. Pincer grasp, opposition pulpa of the thumb against the pulpa of 2-nd finger, pencil, tug upward	cannot be performed can hold pencil but not against tug can hold pencil against a tug	0	1	2
d. Cylinder grasp cylinder shaped object (small can) tug upward, opposition of thumb and fingers	cannot be performed can hold cylinder but not against tug can hold cylinder against a tug	0	1	2
e. Spherical grasp fingers in abduction/flexion, thumb opposed, tennis ball, tug away	cannot be performed can hold ball but not against tug can hold ball against a tug	0	1	2
	Total C (max 14)			

D. COORDINATION/SPEED, sitting, after one trial with both arms, eyes closed, tip of the index finger from knee to nose, 5 times as fast as possible		**marked**	**slight**	**none**
Tremor	at least 1 completed movement	0	1	2
Dysmetria at least 1 completed movement	pronounced or unsystematic slight and systematic no dysmetria	0	1	2
		≥ 6s	**2 - 5s**	**< 2s**
Time start and end with the hand on the knee	at least 6 seconds slower than unaffected side 2-5 seconds slower than unaffected side less than 2 seconds difference	0	1	2
	Total D (max 6)			

			TOTAL A-D (max 66)	
H. SENSATION, upper extremity eyes closed, compared with the unaffected side		**anesthesia**	**hypoesthesia or dysesthesia**	**normal**
Light touch	upper arm, forearm palmary surface of the hand	0 0	1 1	2 2
		less than 3/4 correct or absence	**3/4 correct or considerable difference**	**correct 100%, little or no difference**
Position small alterations in the position	shoulder elbow wrist thumb (IP-joint)	0 0 0 0	1 1 1 1	2 2 2 2
			Total H (max12)	

J. PASSIVE JOINT MOTION, upper extremity, sitting position, compare with the unaffected side				**J. JOINT PAIN** during passive motion, upper extremity		
	only few degrees (less than 10° in shoulder)	decreased	normal	pronounced pain during movement or very marked pain at the end of the movement	some pain	no pain
Shoulder						
Flexion (0° - 180°)	0	1	2	0	1	2
Abduction (0°-90°)	0	1	2	0	1	2
External rotation	0	1	2	0	1	2
Internal rotation	0	1	2	0	1	2
Elbow						
Flexion	0	1	2	0	1	2
Extension	0	1	2	0	1	2
Forearm						
Pronation	0	1	2	0	1	2
Supination	0	1	2	0	1	2
Wrist						
Flexion	0	1	2	0	1	2
Extension	0	1	2	0	1	2
Fingers						
Flexion	0	1	2	0	1	2
Extension	0	1	2	0	1	2
Total (max 24)				**Total** (max 24)		

A. UPPER EXTREMITY	/36
B. WRIST	/10
C. HAND	/14
D. COORDINATION / SPEED	/ 6
TOTAL A-D (motor function)	/66

H. SENSATION	/12
J. PASSIVE JOINT MOTION	/24
J. JOINT PAIN	/24

APPENDIX -3
ACTION RESEARCH ARM TEST

Instructions

There are four subtests: Grasp, Grip, Pinch, Gross Movement. Items in each are ordered so that:

- if the subject passes the first, no more need to be administered and he scores top marks for that subtest;
- if the subject fails the first *and* fails the second, he scores zero, and again no more tests need to be performed in that subtest;
- otherwise he needs to complete all tasks within the subtest

Activity	**Score**

Grasp

1. Block, wood, 10 cm cube (If score = 3, total = 18 and to Grip) _____
   Pick up a 10 cm block
2. Block, wood, 2.5 cm cube (If score = 0, total = 0 and go to Grip) _____
   Pick up 2.5 cm block
3. Block, wood, 5 cm cube _____
4. Block, wood, 7.5 cm cube _____
5. Ball (Cricket), 7.5 cm diameter _____
6. Stone 10 x 2.5 x 1 cm _____

Coefficient of reproducibility = 0.98

Coefficient of scalability = 0.94

Grip

1. Pour water from glass to glass (If score = 3, total = 12, and go to Pinch) _____
2. Tube 2.25 cm (If score = 0, total = 0 and go to Pinch) _____
3. Tube 1 x 16 cm _____
4. Washer (3.5 cm diameter) over bolt _____

Coefficient of reproducibility = 0.99

Coefficient of scalability = 0.98

Pinch

1. Ball bearing, 6 mm, 3rd finger and thumb (If score = 3, total = 18 and go to Grossmt) _____
2. Marble, 1.5 cm, index finger and thumb (If score = 0, total = 0 and go to Grossmt) _____
3. Ball bearing 2nd finger and thumb _____
4. Ball bearing 1st finger and thumb _____
5. Marble 3rd finger and thumb _____
6. Marble 2nd finger and thumb _____

Coefficient of reproducibility = 0.99

Coefficient of scalability = 0.98

Grossmt (Gross Movement)

1. Place hand behind head (If score = 3, total = 9 and finish) _____
2. (If score = 0, total = 0 and finish _____
3. Place hand on top of head _____
4. Hand to mouth _____

Coefficient of reproducibility = 0.98

Coefficient of scalability = 0.97

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APPENDIX -4
Stroke Speci!c Quality of Life Scale (SS-QOL)

Scoring: each item shall be scored with the following key	
Total help - Couldn't do it at all - Strongly agree	1
A lot of help - A lot of trouble - Moderately agree	2
Some help - Some trouble - Neither agree nor disagree	3
A little help - A little trouble - Moderately disagree	4
No help needed - No trouble at all - Strongly disagree	5

Energy

1. I felt tired most of the time. ____
2. I had to stop and rest during the day. ____
3. I was too tired to do what I wanted to do. ____

Family Roles

1. I didn't join in activities just for fun with my family. ____
2. I felt I was a burden to my family. ____
3. My physical condition interfered with my personal life. ____

Language

1. Did you have trouble speaking? For example, get stuck, stutter, stammer, or slur your words? ____
2. Did you have trouble speaking clearly enough to use the telephone? ____
3. Did other people have trouble in understanding what you said? ____
4. Did you have trouble !nding the word you wanted to say? ____
5. Did you have to repeat yourself so others could understand you? ____

Mobility

1. Did you have trouble walking? (If patient can't walk, go to question 4 and score questions 2-3 as 1.) ____
2. Did you lose your balance when bending over to or reaching for something? ____
3. Did you have trouble climbing stairs? ____
4. Did you have to stop and rest more than you would like when walking or using a wheelchair? ____
5. Did you have trouble with standing? ____
6. Did you have trouble getting out of a chair? ____

Mood

1. I was discouraged about my future. ____

2. I wasn't interested in other people or activities. ____

3. I felt withdrawn from other people. ____

4. I had little con!dence in myself. ____

5. I was not interested in food. ____

Personality

1. I was irritable. ____

2. I was inpatient with others. ____

3. My personality has changed. ____

Self Care

1. Did you need help preparing food? ____

2. Did you need help eating? For example, cutting food or preparing food? ____

3. Did you need help getting dressed? For example, putting on socks or shoes, buttoning buttons, or zipping? ____

4. Did you need help taking a bath or a shower? ____

5. Did you need help to use the toilet? ____

Social Roles

1. I didn't go out as often as I would like. ____

2. I did my hobbies and recreation for shorter periods of time than I would like. ____

3. I didn't see as many of my friends as I would like. ____

4. I had sex less often than I would like. ____

5. My physical condition interfered with my social life. ____

Thinking

1. It was hard for me to concentrate. ____

2. I had trouble remembering things. ____

3. I had to write things down to remember them. ____

Upper Extremity Function

1. Did you have trouble writing or typing? ____
2. Did you have trouble putting on socks? ____
3. Did you have trouble buttoning buttons? ____
4. Did you have trouble zipping a zipper? ____
5. Did you have trouble opening a jar? ____

Vision

1. Did you have trouble seeing the television well enough to enjoy a show? ____
2. Did you have trouble reaching things because of poor eyesight? ____
3. Did you have trouble seeing things off to one side? ____

Work/Productivity

1. Did you have trouble doing daily work around the house? ____
2. Did you have trouble !nishing jobs that you started? ____
3. Did you have trouble doing the work you used to do? ____

TOTAL SCORE ____

Reference

Williams LS, Weinberger M, Harris LE, Clark DO, Biller J. Development of a stroke-speci!c quality of life scale. Stroke 1999 Jul;30(7

Appendix 5
CONTROL GROUP RAW DATA

serial no	Lt/rt side	age	FMA PRE	FMA POST	ARAT PRE	ARAT POST	SSQOL PRE	SSQOL POST
1	LT	58	26	32	16	23	97	101
2	RT	41	21	24	17	21	99	117
3	RT	37	22	27	13	21	101	107
4	RT	55	19	21	17	19	100	114
5	RT	60	24	29	19	21	110	112
6	RT	51	21	26	15	18	112	110
7	RT	49	19	23	12	15	96	97
8	LT	38	25	28	15	15	99	102
9	RT	35	21	26	14	17	89	92
10	RT	60	22	31	12	18	93	95
11	RT	56	25	37	15	18	92	97
12	RT	48	22	25	13	18	102	107
13	LT	47	25	29	15	16	90	98
14	RT	36	19	22	15	17	103	109
15	RT	51	27	31	17	21	104	108
16	LT	44	25	30	19	21	109	111
17	RT	47	20	25	15	19	108	108
18	RT	43	27	32	18	17	96	99
19	RT	57	25	28	21	21	99	105
20	LT	42	22	26	15	16	101	103
21	LT	39	20	25	15	17	104	107
22	LT	35	27	31	21	23	99	102
23	RT	60	23	25	15	17	95	99
24	RT	54	22	26	18	19	89	93
25	RT	52	21	27	12	15	88	92
26	RT	46	22	26	15	17	92	99
27	LT	41	28	33	21	22	104	106
28	LT	38	33	34	18	21	101	115
29	LT	45	28	32	16	17	99	105
30	RT	38	26	27	20	22	86	90

Appendix 6
SCALP ACUPUNCTURE GROUP RAW DATA

scalp acupuncture group

serial no	name	age	FMA PRE	FMA POST	ARAT PRE	ARAT POST	SSQOL PRE	SSQOL POST	SEX
1	RT	38	23	32	15	21	91	98	M
2	RT	44	18	34	15	20	103	117	M
3	RT	45	24	33	15	18	111	123	M
4	RT	60	28	38	12	19	100	114	F
5	RT	57	20	28	18	21	90	112	F
6	LT	56	22	34	15	18	96	110	M
7	LT	44	26	37	15	15	93	113	F
8	LT	60	23	39	12	26	99	104	M
9	RT	52	31	40	21	24	94	128	M
10	RT	59	20	36	18	24	104	113	F
11	RT	37	27	48	21	23	107	109	F
12	LT	49	23	31	12	27	99	110	M
13	RT	41	21	39	12	18	107	118	M
14	RT	51	27	40	20	24	100	129	F
15	LT	55	24	33	15	21	93	104	M
16	LT	53	19	27	12	22	104	109	M
17	RT	48	23	39	15	18	99	108	M
18	RT	40	20	33	12	26	90	118	M
19	RT	37	26	35	21	23	91	128	M
20	RT	57	19	23	21	24	103	105	M
21	LT	59	19	28	18	25	96	111	F
22	LT	60	31	37	19	25	105	123	M
23	LT	55	25	33	14	21	111	121	M
24	RT	52	18	32	13	27	105	109	M
25	LT	51	26	34	19	21	101	127	M
26	RT	56	17	22	18	19	99	120	M
27	LT	48	25	33	15	17	106	112	M
28	LT	39	27	31	12	15	101	119	M
29	RT	41	38	41	20	22	109	111	F
30	LT	55	39	46	21	26	99	105	M